No. 1823 Vol. XLVIII NOVEMBER 1st, 1945

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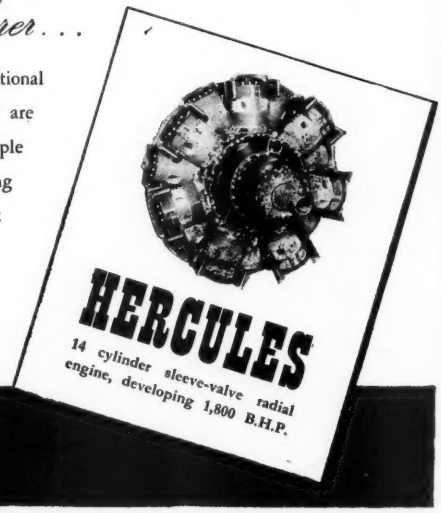

THE BRISTOL AEROPLANE COMPANY LIMITED

FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper.

No. 1923. Vol. XLVIII. November 1st, 1945 Thursdays, One Shilling.

The Outlook

The Future of U.S. Forces

IT is not very long since Mr. Robert Patterson became U.S. Secretary of War in place of Mr. Stimson, but he has lost no time in developing a policy which is absolutely novel and revolutionary. He advocates the unification of the armed forces of the Republic.

Included in this great reform project is a recognition that the air power of the United States must be placed on an equal level with the sea and land power. Since the days of the late General William Mitchell there have been many discussions as to whether or not the United States ought to follow the example of the United Kingdom and other countries and have an independent Air Force. Mr. Patterson concedes the principle, but obviates any objections which may be raised by proposing to abolish the independent position of both Navy and Army. But, and this is notable, he proposes to leave the Fleet Air Arm as part of the Navy.

It goes without saying that the scheme would not make sailors, soldiers and airmen interchangeable. It is intended that each Service should preserve its own traditions. The fusion would take place at the highest levels only. In fact, the scheme is a development of the plan that came into being during the recent wars of having one Supreme Commander. In particular the fusion would take place among the civilians and politicians who would manage the Defence Department under Congress and the President. But money would be saved and administration simplified by pooling research establishments, recruiting, and hospitals, and presumably also the chaplains. Mr. Patterson has appealed to Congress to concentrate attention on the main principles of his scheme and not to stress difficulties of detail which would be ironed out in practice.

One does not envy the task of the man who would be appointed Minister of Defence under Mr. Patterson's scheme. In the United Kingdom the Secretaries for War and Air and the First Lord of the Admiralty have to study their own departments, and bring their requirements before Parliament. Of course, the politicians are not experts, and have to rely on their professional staffs. But the civilians must learn some of the business, and be able to form opinions of their own. For one man to have to put the case before Congress of battleships, submarines, tanks and bombers would put a heavy responsibility upon him. During the wars against Germany and Japan Mr. Churchill, as Minister of Defence, bore that responsibility in a general though not in a detailed way. But it must be remembered that Mr. Churchill had twice been First Lord of the Admiralty, and once Secretary for War and for Air. It is seldom that any nation produces a statesman with such an all-round knowledge of war or such experience of administering Service departments. If the Merger Bill is accepted by Congress, the result will certainly be carefully watched by British authorities. If it works successfully it will be time for us to think of following suit.

Flying Accidents and Safety

IT is one of the unfortunate results of having a free Press, in which too often news value, as it is called, is rated higher than public interests, that air crashes are regularly reported, sometimes with large headlines, while the number of safe flights go unrecorded. Of course, air transport is not the only activity that suffers from this tendency. A major railway accident always has high news value, whereas no paper would dream of reporting that the Flying Scotsman and the Royal Scot had travelled for so many days between London and Edinburgh without harming a single passenger. But the cases are not on all fours. The public has for long accepted railway travel as normally safe, while it has not

yet come to take safety in the air as a matter of course.

For that reason the statement made last week by the Under-Secretary for Air, Wing Commander John Strachey, in the House of Commons, is doubly welcome, and deserves to be brought to the attention of all and sundry. In reply to a question, he stated that the total passenger-mileage for Transport Command had nearly doubled since July 1st last, and had now reached the figure of 190,000,000 passenger-miles a month. On the scheduled services there had been four fatal accidents, causing the deaths of 18 crew members and 18 passengers. Disregarding the crew members, this meant that only one passenger was killed in about 13,000,000 passenger-miles. That may not compare with the expectation of life among regular railway travellers, but it represents a risk so small that very few would hesitate to accept it.

Let each one put it to himself in plain language. If thirteen million people each flew one mile, or thirteen thousand people each flew a thousand miles, and in either case only one lost his life, surely even the most timid must admit that flying is a very safe way of travel. Yet some of the accidents mentioned occurred in conditions of war. When peace is fully restored, it will be possible to make flying a good deal safer.

A Clean Fighter

RELEASE of figures relating to the de Havilland Goblin II turbojet and its associated aircraft, the Vampire, discloses that in this machine the R.A.F. has a very efficient fighter. A speed of 540 m.p.h. for a thrust of 3,000 lb. (corresponding to 4,320 h.p.) must be regarded as extremely good. It means that in "full war paint" the Vampire could beat the existing speed record by 70 m.p.h. That was not the only object of making the record attempt with the Gloster Meteor which, for a very much greater power expenditure, is considerably faster and should be capable of raising the record to the 600 m.p.h. neighbourhood.

A few comparative figures may be of interest, since the two aircraft differ a good deal in size. The thrust per square foot of wing area is approximately 20 lb. for the Meteor. For the Vampire it is only 11.28 lb. The thrusts per pound of loaded weight are 0.58 and 0.35 respectively. If aircraft followed the simple V^2 law, the Vampire should reach 600 m.p.h. for a thrust of 3,700 lb. Unfortunately at these high speeds sonic velocities are approached locally, and thrust required increases more rapidly than as the square of the speed. But the figures do indicate the aerodynamic cleanness of the Vampire fighter.

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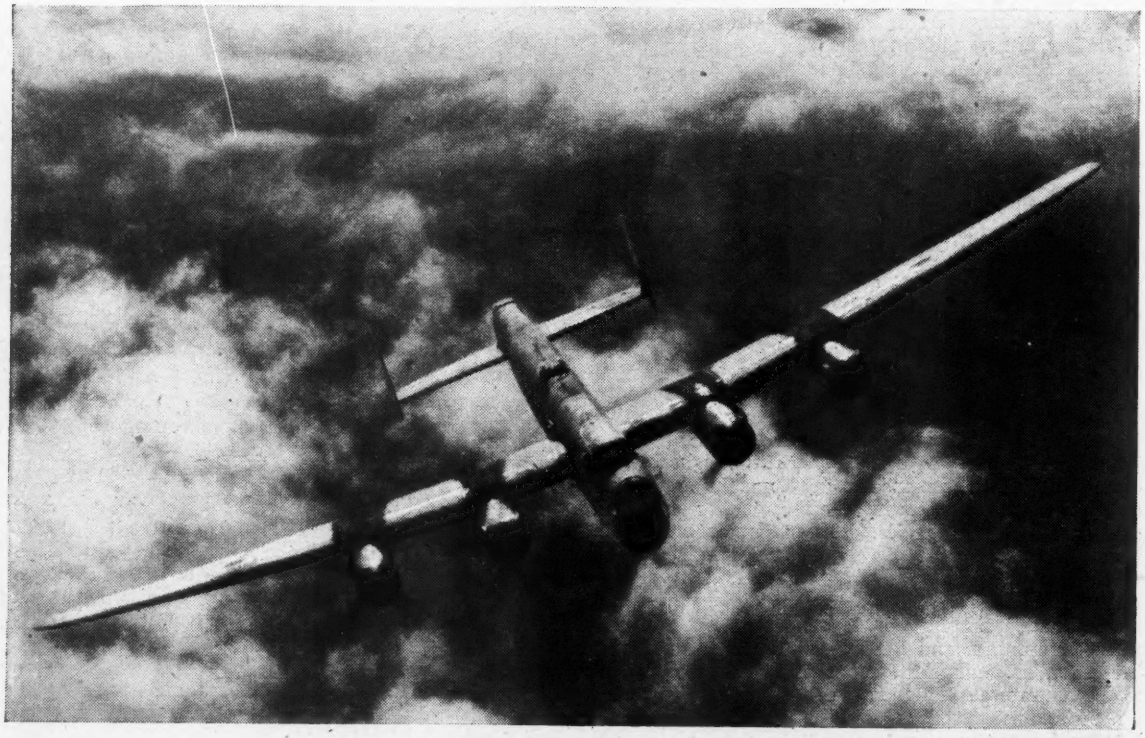
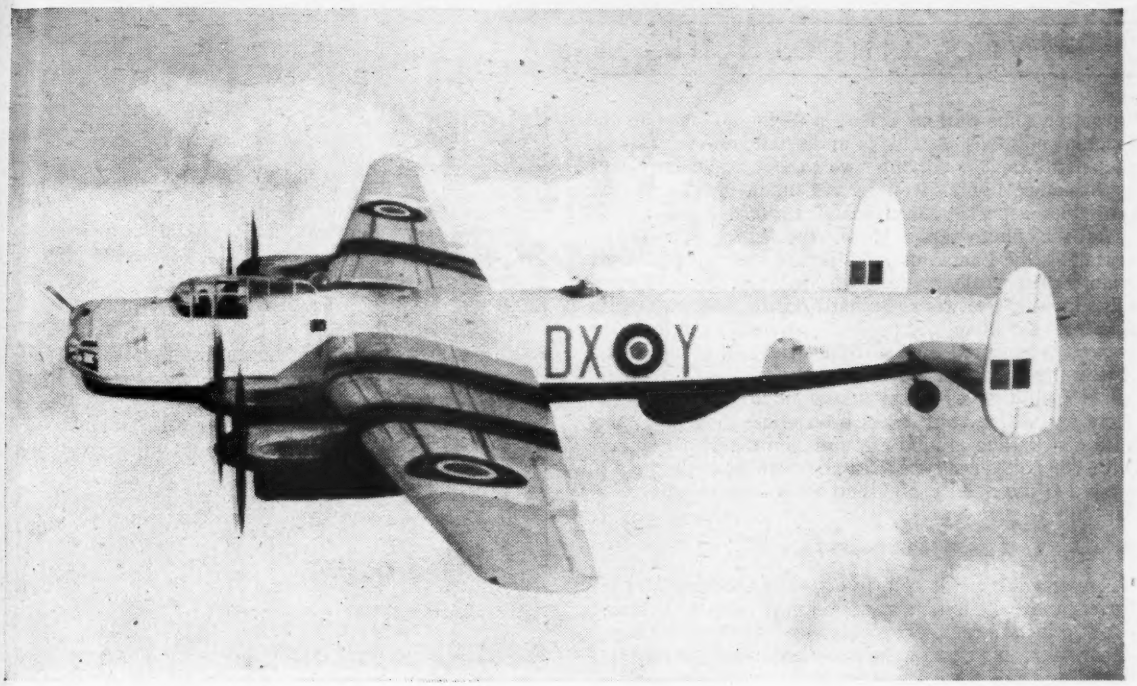


"Flight" photograph.

BRITAIN'S BIGGEST BOMBER : A fine air-to-air shot of the Avro Lincoln by H. J. Julyan. It was taken from the rear turret of another Lincoln and illustrates the unobstructed vision from that position.



Avro Lincoln II

Some Aspects of the Mightiest Bomber in the World

Illustrated by "Flight" photographs.

THERE comes a time in every sphere when even those things held in the greatest regard are superseded. We have had some fine aircraft in the past, but, one by one, sooner or later, they have had to make way for something newer, something better—and, if the successor is of the same family, the stature of the original is carried to new heights by its successor.

Even in the war we have had examples of this in the Spitfire-Spiteful, the Hurricane-Typhoon-Tempest line, and, most recently, in the Lincoln, successor to the magnificent Lancaster.

Mention of the Lincoln has, of course, previously been made in *Flight*, but we are now in a position to supplement by experience the bare elementary facts supplied officially.

In the sub-heading of this article are the words "Mightiest Bomber in the World," and, although there are larger bombers, the Lincoln is, nevertheless, the one aircraft in particular to which the title deservedly applies. It has an almost fantastically large bomb load—even compared with the Lancaster, which, we might point out, carried 22,000 lb.—and allied to this has a radius of action of the order of 1,500 miles coupled with a very high cruising speed. We cannot quote actual figures, be-

The new faceted "beetles-eye" nose of the Lincoln is reminiscent of German practice. The Rolls-Royce Merlins are in circular cowlings.

AVRO LINCOLN II

cause for some curious reason a security clamp on the machine still exists. This is understandable for reasons of patents policy, although we cannot understand how performance figures would have much bearing in this particular aspect. Nevertheless, the ban exists.

As the photographs show, the Lincoln markedly resembles the Lancaster—it is longer and it has a larger span, but basically the aircraft are very alike. Internally, in fact, one would be hard put to it to distinguish one from the other, although the forward view from the cockpit is obscured by the front turret rather more than it is in the Lancaster. The faceted glazing of the bomb-aimer's position would at first sight appear to give an increase in drag, but it has been established that pressure distribution around the nose is, in fact, better than with the Lancaster type. In addition, both the field of view and the quality of vision are vastly improved.

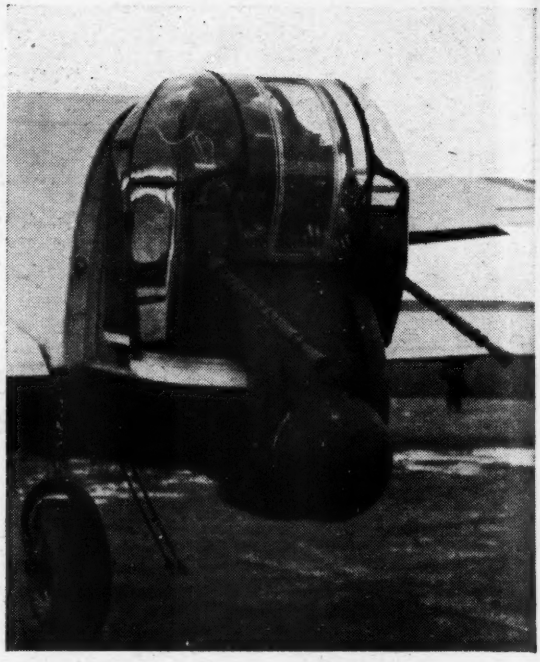
Defensive Armament

Armament consists of twin 0.5in. in the front and tail turrets and twin 20 mm. cannon in the mid-upper turret. Front guns are remotely sighted and fired by the bomb aimer from his station beneath the turret, whilst the dorsal and tail turrets are equipped with gyro reflector sights; however, the tail turret also has, in a bulge beneath, a radar scanner, which gives a trace on a cathode tube and projects it on to the reflector screen, the gyro side of the sight being used to compensate when drawing a bead on the trace. This seemingly far-fetched arrangement has actually been used to shoot down enemy aircraft without the gunner having seen his target, although this did not occur with a Lincoln.

Crews of No. 57 Squadron, 5 Group, who have Lincolns on squadron service trials might be pardoned for feeling that it was a great pity the Japs caved in when they did, for that prevented Lincolns being used against an enemy and thus showing the world what the phrase "heavy bombing" really means. It will be noted that the aircraft have white painted upper surfaces to act as a heat reflector for tropic use.

From the maintenance point of view, the new aircraft is excellent, and the fitters are vastly appreciative of the new circular-section engine cowlings which incorporate hinged panels that can be used as platforms. For combat work, too, there is advantage here, for the panels are thick enough to act as deflective armour against engine casualty. The Lincoln II is fitted with two-stage two-speed Merlin 68 engines of 1,750 h.p., each driving a de Havilland Hydromatic four-bladed airscrew, whilst the Lincoln I has Merlin 85 engines of similar power. Engines are installed as power plants and are fully interchangeable, a complete engine change being possible in roughly 45 minutes. The electrical system is unconventional in that it is single-pole throughout, although it is still 24-volt D.C. Two 6-kilowatt generators are fitted, one on each inboard engine, and a 1,200-watt alternator is fitted on each outboard engine.

In consideration of flying characteristics, from a trip of something over an hour, in not too pleasant weather, the Lincoln seems to be a sweet machine. Flt. Lt. F. M. Jones, A.F.C., who commands the Lincoln Flight of 57 Squadron, takes a very good view of the aircraft, but, as is to be expected, having done a great deal of time on Lancasters, he is not too willing to agree that the Lincoln is greatly superior—from the flying point of view.



A Boulton Paul "D" turret, mounting two 0.5in. guns, protects the rear of the Lincoln. The bulge below the turret encloses a radar scanner to enable the gunner to fire blind at enemy fighters.

He did say, however, that the Lincoln is rather more stable and holds its trim with remarkable accuracy. In view of the Lancaster's qualities in this direction, this is, indeed, praise. Control response is well up to the Avro standard, and control input forces are apparently similar to the Lancaster's, which is undoubtedly in part due to the "mechanical advantage" servo tabs on the control surfaces—which, incidentally, are metal-covered.

As mentioned in the review of the Avro Tudor I (*Flight*, June 28th, 1945), the wing, which is basically identical for Lincoln and Tudor, is flexible to a remarkable degree—in fact, when flying in rough air the tips seem to flap up and down with disconcerting abandon; but we remember being told that under loading destruction tests the wing flexed eight feet at the tip before failing.

We do not wish to raise the issue of the future of the heavy bomber; suffice to say that the Royal Air Force was prepared, and had the Far Eastern struggle continued as was generally expected, the Lincoln would have been there and, equally undoubtedly, would have carried the roundels to new glories.

Span	120ft.
Length	78ft. 8½in.
Height	17ft. 3½in.
Wing area	1,421 sq. ft.
Aspect ratio	10.13
Dihedral (outer panels)	4 deg.
Aerofoil	N.A.C.A. 23,000 modified
Wing loading	52.75 lb./sq. in. +
Weight (max.)	75,000 lb. +

Our Latest on Show

Impressive Display at Farnborough : Newest British Aircraft and Engines Alongside Germany's Best : An Outline Description of an Outstanding Exhibition

NEVER in aviation history has there been such a complete and up-to-date show of aircraft and ancillaries as there was to be seen at Farnborough last Monday. And never, probably, were there so many aviation V.I.P.s, both Service and civilian, gathered in one place. After the years of necessary secrecy it was possible—following the example of the Navy at Heston a few weeks ago—to put most of this country's latest aviation goods in the shop window for semi-public view.

But that was not all. At Farnborough the display which is usually described as a "static" exhibition was as extensive, up to date and impressive as the outdoor display. Apart from the newest examples of our own engines, a very wide selection of German aircraft, engines and ancillaries were included, and the flying display culminated with an actual demonstration of two of the less lethal German jet aircraft.

New Jet Units

There is no doubt at all that jet propulsion, both in the form of exhibited units and in its demonstrated applications, was the keynote of the display.

Even the more knowledgeable visitor was re-impressed and made to realise finally that in jet propulsion we have something that is no mere scientific development of academic interest. Jet units in "production" marks were to be seen in "show finished" form.

Among the power units there were, in fact, three jet types which had not previously been officially "mentioned" by name. These were the Rolls-Royce Nene, a larger and more powerful version of the Derwent V, fitted to the record-breaking Meteors; the Armstrong-Siddeley A.S.X.; and the Metropolitan-Vickers F.2/4 "inline" unit with annular combustion chamber.

Still More Thrust

New, in fact, at least as far as its mark number is concerned, was the de Havilland Goblin II, a development of the unit which was installed in the world's first better-than-500 m.p.h. aircraft. Incidentally, the Nene has recently been fitted to a Lockheed P.80 Shooting Star, considerably raising the performance of the "standard" aircraft. The most impressive flying display was undoubtedly that put up by Mr. Geoffrey de Havilland in the Vampire—once again impressing the "jet" development nature of the show. He completed a high-speed circuit from take-off and demonstrated the impressively good aileron control and stability in tight turns at speeds of the 450-500 m.p.h. order.

By contrast with the Vampire and the Meteor which was flown by a Farnborough test pilot, Wing Cdr. R. Falk, the two German jet aircraft showed by how far this country had advanced. They were very fast, but at the price of fantastic stalling speeds and grimly extended take-off runs, and were a credit more to the courage of German pilots—and, incidentally, to that of the two Farnborough pilots who flew them at the display. Yet these two aircraft, the Heinkel 162, with its single unit installed in V1 manner, and the twin-jet Me. 262, also showed how near we might have been to a possible loss of air supremacy. In fact, the entire display at Farnborough was a monument to German ingenuity and energy, while, by its very diversity, demonstrating a state of panic at a time when they must have known that the end was near.

"Conventional" Aircraft

In some ways, at Farnborough, one felt it to be almost a pity that jet development was not still a matter of whispered rumour and secret flights, for there were many outstandingly interesting types to be seen amongst the "conventional" aircraft. New even to the knowledgeable public were, for instance, the Hawker Fury I, the Bristol Brigand I, the Supermarine Spiteful XIV, and the Martin-Baker F18/39, while neither the D.H. Dove nor the Avro Lincoln II had been previously seen in public.

But new in essence were all the aircraft to be seen both on the ground and in the air. The Dove on show was, we believe, the prototype on which test work is still proceeding at Hatfield, and the firm must have been doubtful about the advisability of wasting even two or three days of development flying in this present stage of civil aircraft production progress. The Hawker Fury was shown in its Sea Fury form at the Naval display, but is entirely new. The Brigand is a Centaurus-engined long-range torpedo dive-bomber and follows the general lines of the Buckingham and the Buckmaster trainer. The "contra" Martin-Baker is, like its predecessors, interesting not only as a fighting machine but as an engineering achievement, with its tubular structure and features of outright accessibility. The Spiteful XIV, first of the new post-Spitfire family, is described in this week's issue of *Flight*; like the Fury, it is one of the new 450-plus series of fighters which are coming along.

Most encouraging of all, in these recovery months, was the show of medium and big civil aircraft. Nobody who saw the lines of the Avro Tudor I, for instance, could doubt that our air transport day was coming. No sign could be seen of its bomber ancestry, while even the Lancastrian, so near to the Lancaster in derivation, looked its part—that of a long-range transport for special purposes.

The impressive Vickers Viking, with its unpainted metal monocoque fuselage, has not lost its Wellington family likeness, but will, in production, move away still further as the fabric-covered geodetic wings are replaced in due time with those of stressed skin.

The Dove, of course, is civil from end to end and is the natural modern successor of the Rapide. Only the Halifax VIII, with its freight pannier and "blind" fuselage, remained as a clear conversion from the Halifax VI; but this aircraft is intended as an ascetic military transport and para-trooper rather than as a serious commercial aircraft.

R.A.E. At Home

In addition to the full-scale aircraft display and the exhibition of German aircraft and equipment, Farnborough itself was open to the "official" public with its twenty-four-foot wind-tunnel, its high-speed wind-tunnel, its structure-testing and materials testing laboratories, its seaplane tank and its engine test beds and all the interesting oddments which are covered by the words aerodynamic research.

Any interested visitor could well have spent the better part of a week in the airfield area while still being able to find new technical worlds to conquer either amongst our own aircraft and engines, amongst the German exhibits, or in the R.A.E. itself. Most of the one-day visitors found themselves suffering from a form of cerebral indigestion after any sort of endeavour to cover the whole thing in a few hours.

In next week's issue we hope to show that we have at least partially digested the more important items on the menu.

HERE AND THERE

Civil Aviation in Germany

THE U.S. Information Service recently announced that Mr. John E. Somers, aircraft control officer of the C.A.A., has been appointed to Gen. Eisenhower's civilian staff as an advisor on aviation and "will study the problems of the eventual restoration of civil aviation in Germany and Austria."

As far as Germany, at any rate, is concerned, the advice of most people in this country would be "DON'T restore it."

Rolls-Royce Canadian Plans

ACCORDING to our Toronto correspondent, it has been announced by Mr. J. D. Pearson, the Rolls-Royce chief technical service engineer in Canada, that a factory for servicing and overhauling Rolls-Royce engines is to be opened at Toronto. The actual manufacture of engines is not planned for the immediate present, but the company is working closely with the R.C.A.F., Canadian commercial airlines, and the Government-owned Turbo Research, Ltd., for the use of the Derwent power-unit.

A North American technical office has already been established at Montreal.

Long Haul

LIGHT aircraft, such as the D.H. Moth, were frequently used at gliding meetings before the war to tow sailplanes up to a couple of thousand feet or so and, more recently, the Taylorcraft Auster has proved to be quite capable of taking a light glider in tow.

Last week, however, a staff Signals engineer who only learnt to fly a glider last August, was towed in a Rhonsperber from the gliding school at Mindeheide, Germany, to another gliding school 60 miles away.

Three of the Jap aircraft, two Dinahs and a Nick, found abandoned on Kallang airfield by the R.A.F. Regiment and R.A.F. Servicing Commandos who were among the first troops to dock at Singapore.

Co-operation With France

WING CDR. JOHN STRACHEY, British Under-Secretary for Air, opening an R.A.F. exhibition at Bordeaux last week, said the co-operation between the Royal Air Force and the French Resistance during the war gave great hopes for future co-operation.

"Faced with the task of reconstruction, the two peoples—as regards policy—have voted the same way," he added. "And now they have elected Parliaments of the same political tendency, I presume they will attack their problems in the same way."

Fast-moving Pair

THE P.R.U. Mosquito crew, Wing Cdr. J. R. Merifield and his navigator, Flt. Lt. J. H. Spiers, are certainly a pair of fast movers.

Early in September they flew from Cornwall to Canada in 6 hr. 58 min. (Spiers having estimated "about 7 hr." just before they took off); now they have flown back in 5 hr. 10 min. and thus lopped half-an-hour off the previous West-to-East Atlantic record.

The distance was just over 2,300 miles and the average speed 445 m.p.h., and though they admittedly had a helpful tail wind, it is still a very good show indeed.

The primary reason for the trip was to visit a P.R.U. school of the R.C.A.F. in Canada, the two-way records being purely incidental.

"Ship Busters"

AN R.A.F. Film Unit production illustrating the enormous damage inflicted by Mosquitoes and Beaufighters of Coastal Command on enemy shipping, especially on the Narvik iron-ore trade, was recently given its "premiere" in Germany and was attended by airmen and "Waafs" of the Occupation Air Force headquarters.

The film, entitled "Ship Busters," was commissioned by Air Chief Marshal Sir Sholto Douglas when he was head of Coastal Command because, he said, not enough was known by the public of the work carried out by the anti-shipping strike squadrons as distinct from the anti-U-boat campaign.

Wing Cdr. A. Gadd, a "Coastal" veteran of many raids, plays a leading role, direction is by Flt. Lt. Anthony Squire (son of Sir John Squire, the poet) and the incidental music is by Leighton Lucas, who wrote the music for "Target for To-night."

Ready and Waiting

OFFICIAL reluctance to let anyone, not in some kind of uniform, get into the air behind a "stick" again (with the obvious exception of civilian test pilots) is severely trying the patience of ardent amateur pilots, both powered and engineless. All over the country there are clubs—gliding clubs especially—whose post-war organisations are ready for a take-off, but they are pegged down by that toughest of all material, red tape.

It is clear, however, that they do not necessarily let this irritating delay depress them unduly—if the Croydon Gliding Club's *News Sheet* is any indication.

Besides keeping members informed of

AIR MARSHAL SIR JOHN SLESSOR had the pleasure of presenting wings to his own son, Cadet J. A. C. Slessor, when he officiated at the first passing-out parade to be held at Cranwell R.A.F. College since the end of the war. The cadets were graduates for commissions.

HERE AND THERE

the club's activities, present and projected, this sheet is such a pleasantly light-hearted affair that it must be a real help in keeping up the club's morale pending the lifting of the official ban on actual gliding.

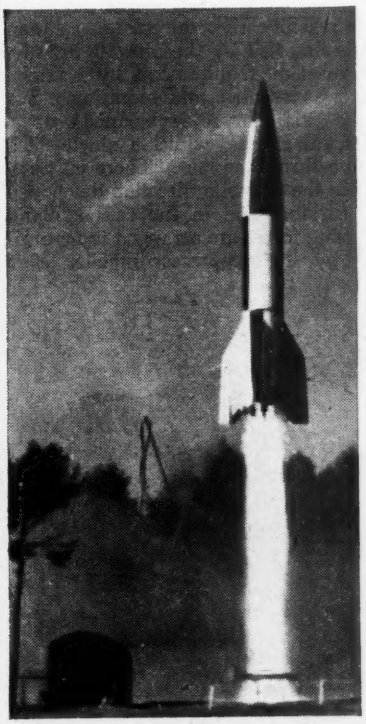
A Fine Gesture Appreciated

SIR EDWARD WILSHAW, chairman of Cable and Wireless, Ltd., whose kindly generosity enabled released prisoners of war in the Far East to send prompt messages to their families and receive their replies, all free of charge, has had many thousands of letters from those whose anxiety has been quickly relieved, expressing their gratitude for this admirable service.

We have seen extracts from some of these letters from parents, wives and mothers, and the touching sincerity of their gratitude must be a source of deep satisfaction to Sir Edward and all those who worked to make the scheme so efficient.

They Want to Stay

TWENTY-TWO thousand applications for permanent commissions have been received from officers of the R.A.F., a high proportion of which have been recommended by commanding officers. At present appointments are being limited to replacing wastage in the 1939 establishment, which comprised some 3,000 officers holding permanent commissions.



A V.2 starts its flight during experiments carried out by scientists of B.A.O.R. at Cuxhaven. Initial speed is said to be quite low.

OLD STRINGBAGS NEVER DIE : A Fairey Swordfish, the only aircraft to remain operational throughout the war in its original form, recently made its last official take-off from a carrier's deck with Vice Admiral Sir Denis Boyd (sans hat) as passenger. The ship was the new Light Fleet Carrier, H.M.S. *Ocean*.

News in Brief

FLT. LT. NORMAN HILL has returned to the staff of Tecalemit, Ltd., as manager of their aircraft division, following his release from the R.A.F.

* * *

Mr. Thomas Gammon, superintendent of Vickers-Armstrong's aircraft works, has been appointed a special director of the company.

* * *

Squadron Leader John Pudney, the author and poet, who is serving in the Air Ministry Public Relations Department, is visiting Sweden to give British Council lectures on "Air Travel and Writing" and allied subjects.

* * *

Sqn. Ldr. G. C. Stonley, who has recently been released from the R.A.F., has returned to Brown Brothers (Aircraft), Ltd., and will be chiefly concerned with the export side of the business.

* * *

Air Industrial Developments, Ltd., manufacturers of compressed air and paint-spraying equipment, are moving into new and larger showrooms at 28, South Molton Street, London, W.1, early this month.

* * *

The British Aluminium Co., Ltd., whose temporary head office is at Salisbury House, London Wall, E.C.2, announce that their telegraphic address has been changed to Britalumin Ave. London, and the address for cables will be Britalumin, London.

* * *

Resuming its pre-war practice of sending executives to America to study industrial progress, the Laycock Engineering Co., Ltd., has despatched Messrs. Sidney Walker (joint managing director), T. R. Charlesworth (chief designer), and Robert Walker (sales manager of the garage equipment department) to the U.S. for this purpose.

* * *

Mr. E. T. Heelas, who has served throughout the war in the R.A.F. and was previously a commercial pilot, has been appointed assistant sales manager to Percival Aircraft, Ltd., and the Hon. Mrs. R. Moore, who formerly held this post, becomes publicity manager to the Hunting Aviation Group. Sqn. Ldr. J. S. Danby, also ex-R.A.F., has been made assistant group sales manager under Group Captain F. H. L. Searle, group sales manager.

* * *

It is announced with regret that Major H. W. Van Weerden Peelman, the Dutch fighter pilot, who was well known for his brilliant flying in pre-war air displays, was killed in a road accident on October 19th. He made the first flight from Holland to the Netherlands East Indies in 1924.

* * *

Two hundred specialists and airmen of a Canadian supply squadron are to make a 3,000 miles trek across the "top" of Canada to continue cold weather experiments launched last year in British Columbia and Saskatchewan. The expedition, which will last three months, will have the code name "Muskox."

* * *

Britain's second National Model Aircraft Exhibition is to be held at Dorland Hall, Piccadilly, London, S.W.1, from December 14th to January 12th. This exhibition, organised by *The Aeromodeller*, ran for a week last year and attracted some 20,000 visitors. A series of competitions, entry free and open to all, has been arranged, with £300 in cash prizes and silver trophies to be won, for all types of models.

* * *

The R.A.F. and the Fleet Air Arm have been supplied during the war period with a total of 1,822 aircraft from the Wolverhampton factory of Boulton Paul Aircraft, Ltd.; there were 1,060 Defiants, 657 Barracudas, and 105 Rocs. Spares equivalent to another 395 aircraft, 1,597 gun turrets, 207 sets of special turret equipment for training and test purposes, and a large quantity of other miscellaneous items were also supplied.

* * *

A Swiss aircraft left Zurich last week with 67 cases of watches for Great Britain.

De Havilland Goblin

Some Details of the Turbine-jet Unit Now in Production for the de Havilland Vampire

THE engine-building activities of the de Havilland Co. have tended to become somewhat overshadowed by the outstanding performance and war record of the Mosquito aircraft. Consequently, the recent release of the news that the company had developed a turbine-jet unit for its new Vampire fighter came as a surprise to all outside "informed circles."

It was in January, 1941, that the first discussions on the subject were held and three months later a decision was taken to commence working designs of a unit to develop a thrust of 3,000 lb. for installation in the projected Vampire. The first drawings were issued to the shops on August 8th, and on April 13th in the following year the unit was ready for its first run on the test bed. In less than two months it was operating satisfactorily on its full designed thrust. Production of the jet engine outstripped that of the aircraft, and to obtain flight experience two units were first flown in a Gloster Meteor aircraft on March 5th, 1943. It was not until September 20th that year that the Goblin was flown in a Vampire.

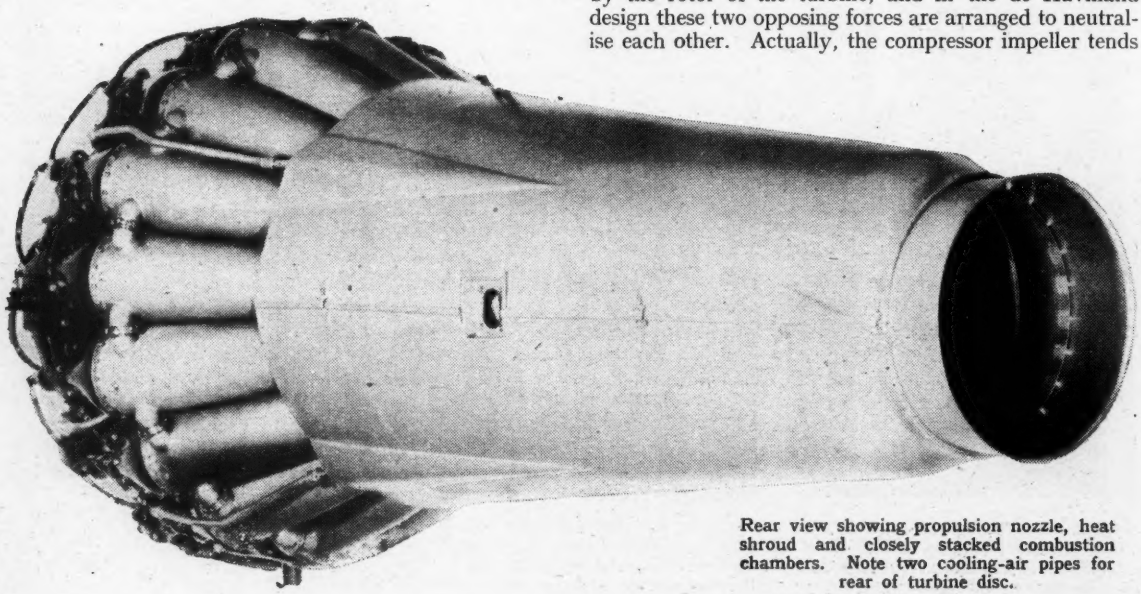
It is interesting to record that Goblin units were shipped to America and flown in the Lockheed Shooting Star. Both the Vampire and the Shooting Star by the spring of 1944 were exceeding 500 m.p.h., and it is claimed that these were the first aircraft in Britain or America to achieve that speed.

In January, 1945, the Goblin successfully passed an official type-approval test and now holds Type Certificate No. 1 for a turbine unit for aircraft propulsion. Following the de Havilland tradition, a high degree of reliability has been one of the principal aims, and a Goblin unit has already been run for 500 hours under official type test conditions without the change of any main component. The development throughout has been conducted in closest co-operation with the Air Ministry and Ministry of Aircraft Production.

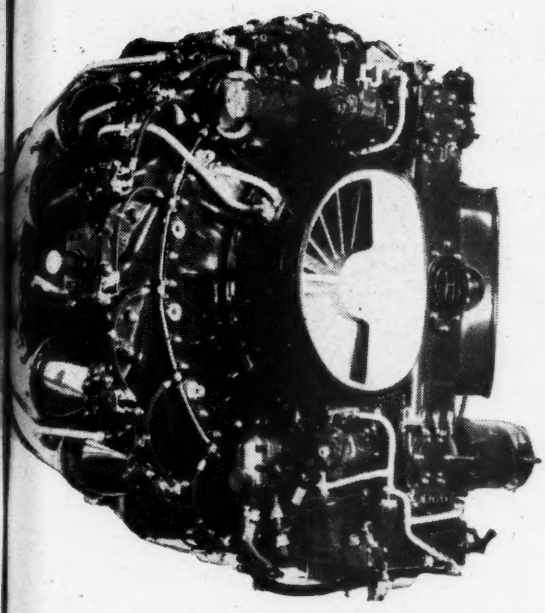
The Goblin is a linear descendant of the early Whittle units. It comprises a single-sided centrifugal compressor delivering air to sixteen combustion chambers grouped symmetrically around the axis of the unit and leading to the nozzle of the single-stage axial turbine which drives the compressor. Compressor impeller and turbine rotor are coupled by a tubular shaft to form a single rotating assembly which is mounted on only two ball bearings. The maximum diameter of the engine, around the compressor casing, is 50in., and with a jet pipe of minimum length fitted the overall length is about 8ft. Equipped with a jet pipe and all the necessary engine auxiliaries the dry weight of the complete unit is 1,500 lb. Fuel consumption is at the rate of 1.23 lb./hr. per lb. thrust.

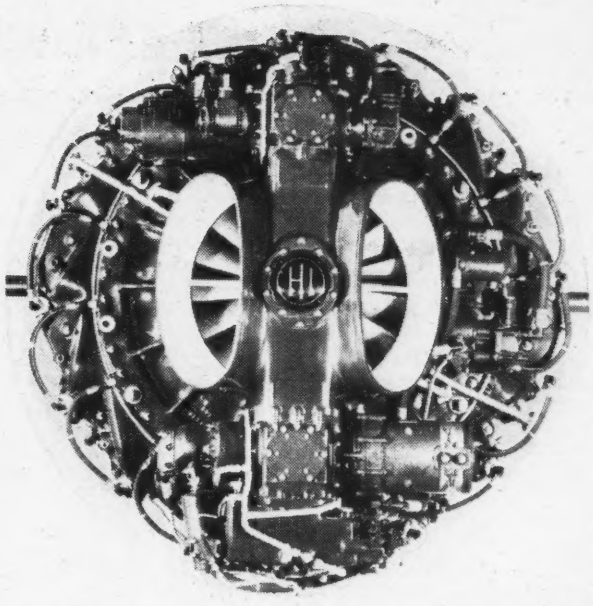
Air Compressor

Turning to the main components, the retention of a single-sided impeller for the centrifugal compressor aims to provide the maximum diameter of entry and to take full advantage of ram effect. It is held that the double-sided impeller is slightly less efficient as the air must first pass through what is in effect a balance chamber for the two intakes. Furthermore, there is some degree of preheating of the air reaching the rear intake. Within the dimensional limits imposed by the aircraft installation it is possible to meet all requirements by a single-sided impeller; simple to produce and requiring a less complicated casing. Axial thrust is balanced on a double-sided impeller, of course, whilst a single-sided impeller has a positive thrust loading. There is, however, an axial thrust in the opposite direction developed by the rotor of the turbine, and in the de Havilland design these two opposing forces are arranged to neutralise each other. Actually, the compressor impeller tends



Rear view showing propulsion nozzle, heat shroud and closely stacked combustion chambers. Note two cooling-air pipes for rear of turbine disc.



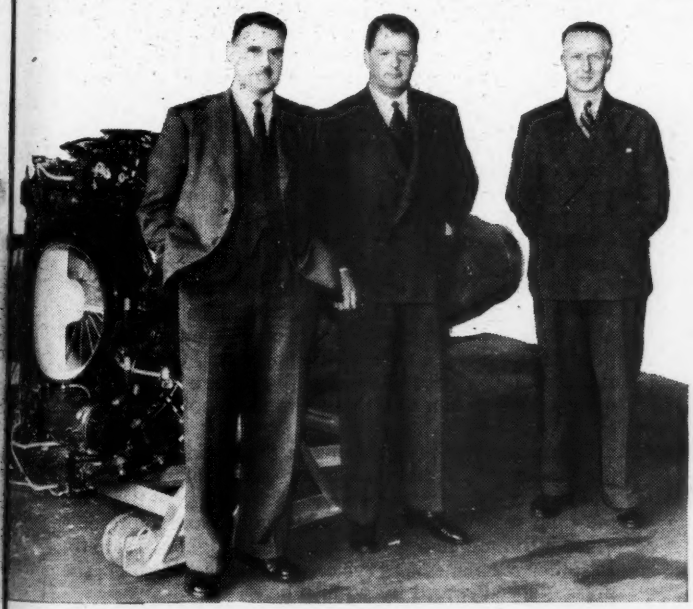


Neat grouping of auxiliaries on the front of the compressor. Diagonal pipes deliver cooling air to turbine bearing and disc.

to draw off in a forward direction whilst the turbine rotor tends to fly off to the rear and the connecting shaft is thus placed under tension.

The full rated thrust is developed at 10,200 r.p.h., and at this speed the peripheral velocity of the impeller is considerably in excess of the speed of sound. The delivery is approximately 60 lb. of air per second. Reduced to familiar terms, this means that a room 60ft. long, 40ft. wide and 20ft. high would be completely emptied of air in just over one minute and serves to show the enormous volume of air which flows continuously through a jet engine.

It will be noted that the compressor intake is divided. When installed in an aircraft fuselage, this feature enables the air to be ducted from so-called "nostrils" in the wing roots or on the side of the fuselage. If mounted in a wing nacelle, the engine is turned 90 deg. on its axis to bring the intake branches vertical and a single re-entrant duct then provides a clear passage for the wing leading-edge spar.



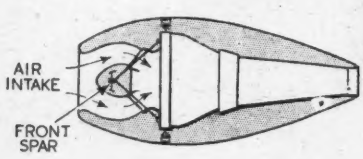
MEN AND MACHINE: The leaders of the team responsible for the Goblin. (Centre) Major F. B. Halford, F.R.Ae.S., M.S.A.E. (Left) Mr. J. L. P. Brodie, M.I.Mech.E., M.I.A.E. (Right) Mr. E. S. Moult, B.Sc., A.M.I.Mech.E.

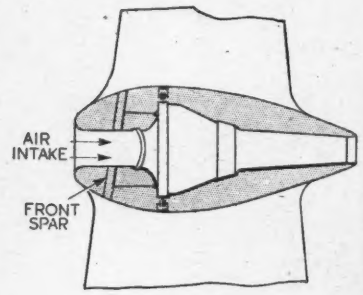
Combustion Chambers

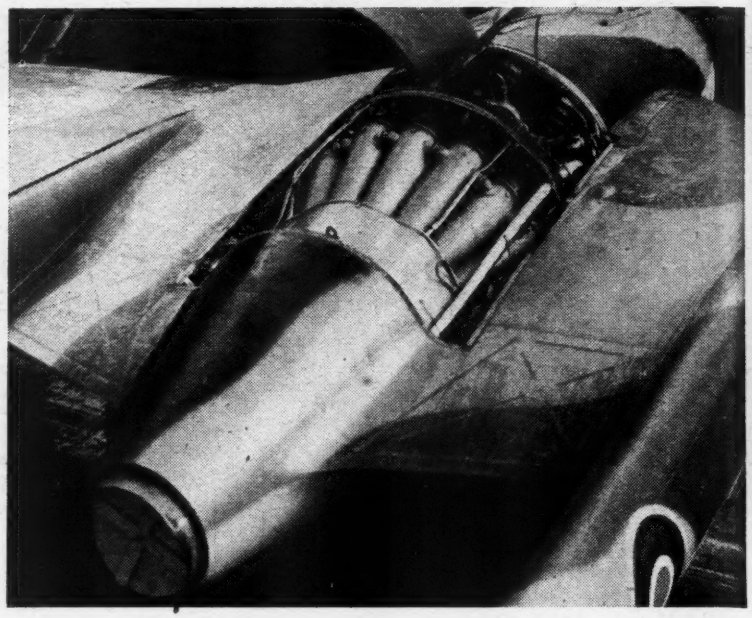
Energy is added to the air stream by burning Aviation Kerosene (paraffin) in the sixteen combustion chambers. These are of the straight-through type with downstream injection of fuel from burners located at the forward end. Each chamber is of fabricated sheet steel and comprises an outer casing flanged to the diffuser of the compressor at the forward end and making a sliding joint with the turbine nozzle assembly at the rear to accommodate expansion under heat. Inside this casing is a co-axial flame tube located by three radial pins at the forward end and at the rear slidable in the tail of the casing. The burner projects into the perforated end of the flame tube and a shroud round the burner is arranged to admit from one-quarter to one-third of the air supply for primary combustion. The remaining air flows between the flame tube and the outer casing and, passing through holes to the interior of the flame tube, dilutes and lowers the temperature of the burning mixture prior to it reaching the turbine nozzle. As is customary, the sixteen chambers are interconnected by pipes in the region of the primary combustion zone to balance pressures and spread the ignition flame.

At the turbine nozzle the gases pass through a continuous ring of stationary guide vanes which direct the stream at the appropriate angle of attack for the blades mounted in the periphery of the turbine disc. The turbine converts part of the heat energy released by

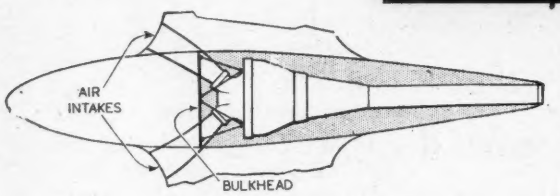
DE HAVILLAND GOBLIN



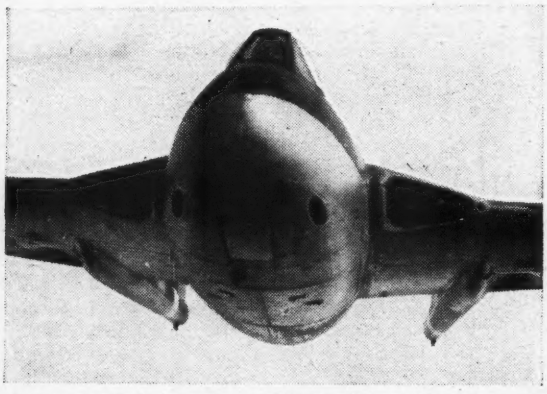




(Above) Mounting in wing nacelle.
(Right) Installed in the Vampire.
(Below) Mounting in fuselage.



combustion of the fuel into kinetic energy, and this is delivered as mechanical energy to drive the compressor. At full rating the turbine delivers about 6,000 h.p. at the shaft. It is, of course, necessary to provide some means of cooling the turbine disc. Air is piped from the diffuser casing of the main compressor to annular cooling spaces around the intake eye. From here it is carried by external pipes to enter the space between the inner and outer housings bridging the compressor and turbine assemblies, and is delivered round the turbine bearing and passes up the forward face of the turbine disc. Four external pipes, clearly visible in the illustration, lead from points on the compressor casing behind the impeller to the rear of the turbine and, by way of the tubular supports of the inner cone of the jet tube, air is delivered to the space behind the turbine disc and passes up the rear face towards the blades. Both supplies discharge into the main stream passing out to the jet pipe.



Head view of Vampire in flight shows disposition of intakes.

Auxiliary Services

Around the exterior of the jet pipe is a muff through which air piped from a forward-facing aperture is warmed before being led to the pilot's cabin and, for instance, the gun enclosures of a military aircraft. Extending from a position forward of the turbine nozzle ring to the propulsion nozzle at the end of the jet pipe is a heat-insulating shroud, open at the front and at the rear terminating in an annular venturi. This serves to protect the inside of the nacelle and maintain a cool temperature throughout the enclosure as it functions as an extractor, inducing air through louvres at the front of the nacelle and discharging it around the propulsion nozzle at the rear.

Auxiliary components are mounted in upper and lower groups on the front of the compressor casing. The drive from the main shaft is by a vertical shaft passing between the intake branches and by bevel gears to cross-shafts. On the upper side is arranged a 1,000-watt generator, a vacuum pump for flight instruments, a compressor for aircraft brakes, a positive displacement blower for cabin pressurisation and an electric tachometer. On the lower side are the starter motor, high-pressure fuel pump, overspeed governor and the hydraulic pump for aircraft services.

When installed in the Vampire the 3,000 lb. thrust of the Goblin gives that machine a speed of 540 m.p.h. when it is carrying its full service equipment. This must be regarded as remarkably good, and represents 4,320 h.p. for a complete power plant weight of 1,500 lb. In other words, the service Vampire could beat the present speed record by 70 m.p.h.

A.I.D. Test House

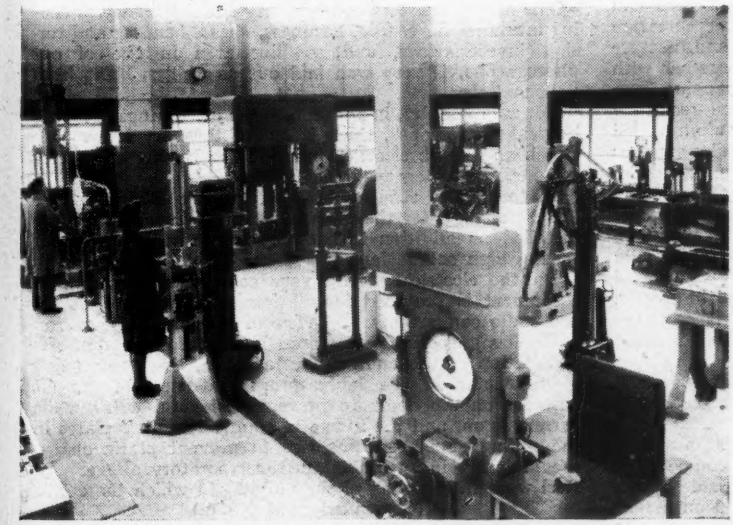
Complete Equipment for the Testing of Every Form of Aircraft Material and Component

HOW many people not actually connected with the aviation industry, we wonder, realise that every single item comprised in the thousands of components which go to make a modern aircraft is subject to the rigid tests of the Aeronautical Inspection Directorate? And not only the parts themselves, but the materials with which they are made, the accuracy with which they are put together and the final accuracy of their functioning. Realising this, it can be seen that everything about an aircraft from the basic material itself, through all the varying processes of machining, of assembly, of installation, until finally the machine takes the air, is carried out to the established criteria of, and inspection by, the A.I.D.

In every firm and organisation producing anything that is to be used in an aircraft are resident A.I.D. inspectors whose job it is to ensure that the concerns' products fulfil A.I.D. requirements, and thus it may be appreciated that the manufacturers must of necessity have means of checking the standards required of their productions.

The purpose of the A.I.D. Test House at Harefield is primarily to provide facilities for check testing the work of contractors, but in addition to this work it also looks after the functioning tests of any instrument as well as the inspection of engineers' precision gauges used by A.I.D. inspectors at contractors' works. Another, and by no means the least important, duty of the Test House is the development of inspection techniques and methods; this is applicable to all sections and, in certain instances, includes the designing of new test apparatus; and in point of fact, where desirable and practicable, prototypes of new apparatus are made in the Test House workshops.

There are three basic technical branches: (i) Materials, (ii) Aircraft equipment, and (iii) Metrology, all of which hold, wherever practicable, reference standards which have been certified and are regularly checked by the National Physical Laboratory or other appropriate authority; however, when actual standards are not practicable some form of reliable sub-standard is provided, and this enables all equipment to be periodically checked, and if necessary ad-



The beautifully laid-out mechanical test laboratory is comprehensively equipped and scrupulously clean.

A.I.D. TEST HOUSE

justed, which in turn ensures the high standard of accuracy of all tests carried out in the laboratories.

The Materials Division deals with both physical and analytical tests of all classes of materials both metallic and non-metallic, including plastics, fuels and lubricants. In many instances testing for defects is carried out by X-ray and other non-destructive methods. The Aircraft Equipment Division is provided with apparatus for carrying out check tests on all types of instruments, whether optical, mechanical or electrical; and the Metrology Division is equipped for checking and testing all types of gauges used by A.I.D. inspectors. A tool room equipped with a comprehensive range of machine tools is included in the latter division whereby gauges are repaired or modified as necessary and where, if required, the manufacture of a limited number of urgent specialised gauges can be undertaken.

Air in the main building is completely conditioned, and temperature is controlled within a range of 60-70 deg. F. Where essential to the nature of the work the laboratories are controlled to $68 \pm \frac{1}{2}$ deg. for gauge work; $68 \pm 2\frac{1}{2}$ deg. for instruments and W/T standards, and 70 ± 1 deg. with 65 per cent. +1 per cent. relative humidity for the textile laboratory. In addition, all water is treated by an O.C.P. water conditioning plant.

To give anything in the nature of a detailed survey of the establishment would need a great deal of space which we simply have not at our disposal, but we can give an impression of some of the more interesting aspects of the work carried out at Harefield as demonstrated by a compressed and rather swiftly conducted tour.

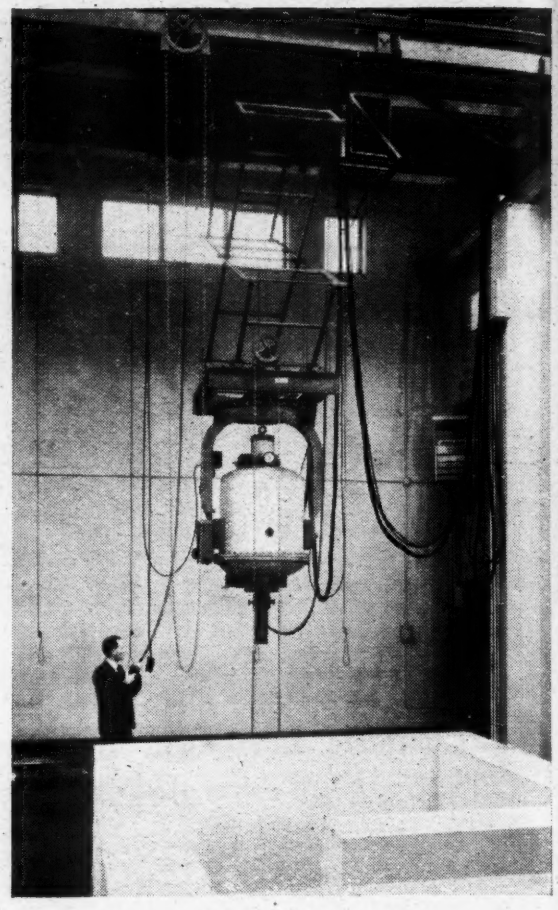
Maintaining Inspection Standards

One of the most striking of the immediate impressions received is that an atmosphere of quiet competence prevails which, allied to the neatness of layout and almost hygienic conditions of cleanliness, strengthens immeasurably the conviction that in this organisation they have things pretty well "buttoned-up." It should be pointed out at once that the Test House is not a research establishment (save in the sense of investigating inspection techniques), but is concerned purely with the maintenance and effectiveness of inspection standards for every branch of the aircraft industry.

Among some of the more interesting items of equipment are two stroboscopes which are used for checking mechanically operated r.p.m. indicators. Both the instruments are controlled by 50-cycle tuning forks and have an accuracy of 0.1 per cent. One has a range of up to 6,000 r.p.m. and the other up to 6,500 r.p.m. and each can handle six indicators at a time. For checking pressure gauges and instruments for the control of flow and pressure of oxygen, the dead-weight method is used together with float-and-taper-tube flow meters of capacities ranging from 0.01 to 140 litres/min. Check tests on time recording apparatus are facilitated by a standard pendulum which controls all the clocks in the main building and also supplies variously timed impulses to such laboratories as require this service.

To supplement X-ray investigation of the soundness of materials, a supersonic device is employed which can handle material thicknesses of from $1\frac{1}{2}$in. up to 8ft. Artificially excited quartz crystals are used to project supersonic sound waves through the material, which are reflected to give an indication on a cathode-ray tube, the characteristics of the trace showing the position and relative size of any internal defect.

The X-ray laboratories are equipped with 220,000 volt Siemens-Schuckert, 180,000 volt Phillips and 140,000 volt Siemens-Schuckert sets, and in addition a Hilger crystallographic unit is installed. A special new building has been constructed to house two new sets, one of 1,000,000 volts and the other of 400,000 volts, both sets being made by the Victor X-ray Corporation. Both are suspended on extensible toggle mountings carried on an overhead gantry, and a deep pit in the floor is arranged to house the object to be examined. Owing to the tremendous penetrative powers of the X-rays from these items of equipment, the building is isolated and the control room is protected by concrete walls three feet thick.



This 1,000,000-volt X-ray plant is the latest thing of its kind and is installed in a heavily protected and isolated building.

The mechanical testing laboratory has a diversity of testing machines for tensile, hardness, shear, bending and torsion investigations, and, as illustrated in one of our photographs, is very well laid out as well as being both light and airy.

For micrography, in addition to the usual range of metallurgical microscopes, there is one of the very latest type Bosch and Lomb electrical microscopes having a capacity of 40,000 diameters magnification.

In the Petrol Annexe of the Materials Division three C.F.R. engines for the determination of knock rating are installed, in addition to two C.3 type engines for power testing high octane fuels.

On the electrical side a very comprehensive range of equipment is provided for all forms of testing electrical and radio components. In view of the high voltages (up to 100,000), special precautions have been taken in the installation of the equipment, including the "earthing" of all metal in the laboratories, provision of cut-out switches on the doors to prevent accidental entry while current is on, and the fitting of copper "earth" plates in the ceiling above the bus-bars to prevent static charge accumulating in any metal in the laboratory above. All steel work in the wing of the building in which these labs

(*Continued on page* 480.)

HERMES RANGE 3030 MILES

WITH 8850 LB PAYLOAD

1740 MILES WITH 15950 LB

HANDLEY PAGE

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The First Freedom ?

Preparing for Post-war Gliding : Two New Sailplanes Described

THERE appears to be a reasonable chance that, in the not too distant future, the ban on gliding by private individuals will be lifted. Certainly, "gliding freedom" is, in present circumstances, likely to be the first to be obtained by the amateur, who may have to wait for quite a while before he is permitted to go his own way in power-driven aircraft. Furthermore, it is even possible that the ex-Service or ex-A.T.A. pilot may, apart from the question of finance, actually prefer to take up a "new" sport rather than to return, so to speak, to his E.F.T.S. days with any types of light aircraft which may be available.

At least for the first year or two it is probable that the great majority of gliding club members will be those who already have adequate flying experience, and it would seem that the immediate need will be for dual and solo high-efficiency gliders rather than for primary gliders. The few of the latter that are available should be adequate for the training of the inexperienced. No medium or high-performance types have been built in this country for the last six years, and very few were built even before the war. So there should be quite a useful market both here and abroad for sailplanes.

Pre-war light aircraft pilots will no doubt remember the little single-seater built by Chilton Aircraft, of Hungerford. After a "war" of sub-contracting, this firm is now going ahead with the construction of a sailplane, since only in gliding can an immediate market be seen for any aircraft. The firm has chosen the Olympia as a type worth development.

Olympic Specification

It may be remembered that when the 1940 Olympic Games were planned, soaring was included amongst the competitive sports, and it was decided that all should fly an identical aircraft. A committee was formed to lay down the basic requirements of this aircraft. Interestingly enough, this committee limited the wing-span in order to obtain an easily handled machine, and stipulated a minimum weight in order to discourage cheese-paring. An amply wide cockpit, dive-brakes limiting the terminal velocity to 124 m.p.h., and a severe set of strength requirements were also included in the specification. In all, this specification demanded a robust and sensible machine. There were eight entries from various countries and the Olympia sailplane was the winner of this competition.

Generally conventional in layout, the Olympia has a number of interesting features which make for ease of assembly and maintenance, and it is fully aerobatic. Research suggests that the gull-wing is not necessarily as efficient as had previously been supposed, and the wing-shape of the Olympia is of normal design, with a taper ratio of 2.6 to 1 and a dihedral angle of 2.5 deg. The section at the root is Gottingen 549, thickened to 16 per cent. of the chord to allow the use of a deep spar, with a tip section of Gottingen 676 to give better stalling characteristics. To obtain good fore and aft control and stability the tail surfaces are larger and further from the wing than has been previously usual. Small but important points, such as rudder-pedal adjustability and a manually operated tab trimmer, have been included, and the instrument panel, including, in the standard aircraft, an A.S.I., a variometer, a turn and bank indicator, an altimeter and a compass, can be quickly removed if the machine must be left unattended after a cross-country. There is a compartment behind the pilot for the mounting of a barograph.

The Olympia is small and the design subscribes to the modern theory which is aimed primarily at obtaining a good L/D ratio at higher speeds in the interests of "penetration." In earlier designs efforts were made to obtain the lowest possible sinking speeds near the stall, with the result that efficiency went to pieces at high cruising speeds.

Quite a large number of Olympias—believed to be about 1,000 were built in Germany—for *Luftwaffe* training, but, not unnaturally, Chilton Aircraft have had to put in a lot of hard work in "Anglicisation" and in making the various fittings more suitable for production. Service pilots who have flown German-built Olympias have been enthusiastic about their performance and stability.

Six of the first machines off the production "line" are, incidentally, to be supplied to the Derbyshire and Lancashire Flying Club.

THE CHILTON OLYMPIA

DIMENSIONS AND WEIGHTS

Span	49.3ft.
Length	22ft.
Wing area	161 sq. ft.
Wing loading	3.48 lb./sq. ft.
Aspect Ratio	15
Weight empty	353 lb.
Load	209 lb.
Structure weight/all-up weight	0.625
Structure-weight/wing area	2.19 lb./sq. ft.

PERFORMANCE

Best gliding angle (L/D)	25 : 1 at 45 m.p.h.
Minimum sinking speed	2.2ft. per sec. at 39 m.p.h.
Stalling speed	31 m.p.h.

LOAD FACTORS

C.P. forward	10
Diving	2
Pull-out	10
Inverted flight	5.5
In gusts of 33ft. per sec.	2

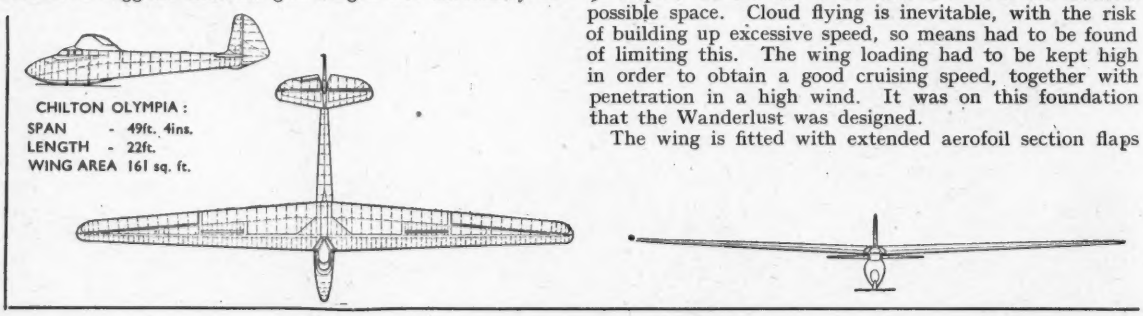
Private Venture

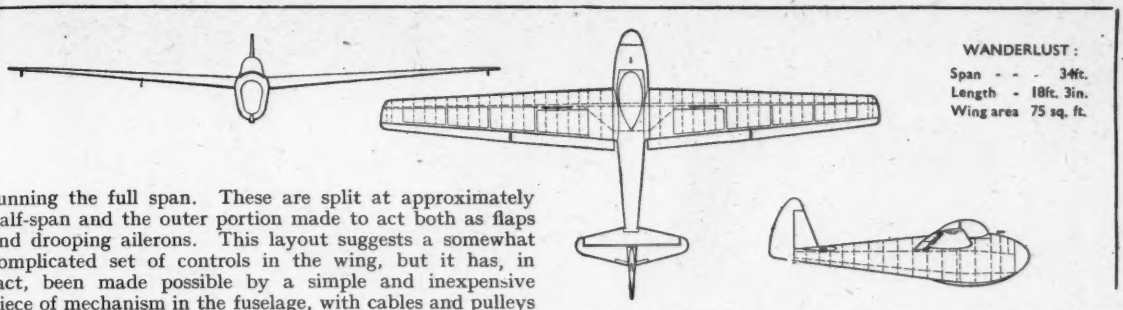
Another interesting sailplane, named the Wanderlust, of new design, is being built in their own time by two draughtsmen, T. E. Brown and K. W. Radbarn, employed by Miles Aircraft. This aircraft, incidentally, is being built without machine tools.

The most noticeable feature of the Wanderlust is its small size. The question of size has been discussed at great length in the past, and the makers consider that the smallest machine possible, with medium all-round performance and good cross-country performance, is required for reasons of handling ease.

Since the Wanderlust has been primarily designed for cross-country work, the maximum mileage per hour with the lowest sinking speed was aimed at, and the machine had to be manœuvrable at 36 m.p.h. and efficient at 90 m.p.h. It had also to be able to land in the smallest possible space. Cloud flying is inevitable, with the risk of building up excessive speed, so means had to be found of limiting this. The wing loading had to be kept high in order to obtain a good cruising speed, together with penetration in a high wind. It was on this foundation that the Wanderlust was designed.

The wing is fitted with extended aerofoil section flaps





running the full span. These are split at approximately half-span and the outer portion made to act both as flaps and drooping ailerons. This layout suggests a somewhat complicated set of controls in the wing, but it has, in fact, been made possible by a simple and inexpensive piece of mechanism in the fuselage, with cables and pulleys as the only controls in the wing. The flaps are actuated by a handwheel in the cockpit. This also droops the ailerons, which have been designed with an extreme differential movement to overcome adverse yawing movements.

In order to improve the cruising characteristics and to take the aero-towing stresses, the wing sections vary somewhat from those of past practice. N.A.C.A. sections have been used. The root section is 23021 and the tip section 4315, with 2 deg. washout to improve stalling characteristics. These sections have a very small c.p. travel, which is more essential since the flaps, when lowered, cause a fairly large pitching moment.

The wing itself is of normal type, with a single box spar and ply-skinned nose to give torsional stiffness. Aft of the spar the wing is fabric covered—the only fabric on the machine. Torsional and drag loads of the wing are carried back to the fuselage by the use of a drag strut through the wing. Assembly of wing to fuselage is through five bolts only, the controls being automatically linked up by the mating of the wing to the fuselage side.

WANDERLUST SAILPLANE

DIMENSIONS, WEIGHTS AND DATA

Span	34ft.
Overall length	18ft. 3in.
Height (tail down)	4ft.
Wing area	75 sq. ft.
Flap area (total)	13.65 sq. ft.
Aileron area (total)	13 sq. ft.
Tailplane and elevator area	12 sq. ft.
Fin and Rudder area	7½ sq. ft.
Root chord	40in.
Tip chord	18in.
Aspect ratio	15.4
Root section	N.A.C.A. 23021
Tip section	N.A.C.A. 4312
Dihedral	4°
Weight (empty)	190 lb.
Weight (all-up)	375 lb.
Wing loading	5 lb./sq. ft.

PERFORMANCE (ESTIMATED)

Stalling speed	32.4 m.p.h.
Best gliding angle	1 in 25
Best gliding speed	35-37 m.p.h.
Speed range	35-95 m.p.h.
Rate of sink at 95 m.p.h.	6.5ft. per sec.

Wing spoilers are used to shorten the hold-off and to check dangerous speeds. These are of simple design, the mechanism consisting solely of parallel links. It may be remembered that, just before the war, it became compulsory in Germany to fit spoilers to all sailplanes.

The cockpit is larger than was previously usual; the aircraft may be flown either with open or closed cockpit. The rudder pedals are adjustable.

Between the skids and fuselage bottom, a pneumatic form of shock absorption is used, consisting of a sealed-off motor cycle tube which is held between the skid and fuselage by a canvas covering.

A very simple form of fuselage structure is used, dispensing with laminations and jig assembly. Only two laminations have been used on the entire fuselage.

The tailplane is of normal construction, and is completely faired into the fuselage. The elevator has two cockpit-controlled trimmer tabs.

It is hoped that the Wanderlust will also be available in kit form. The selling price of the finished machine should be less than £250.

"FORTS" WORTH MILLIONS LEFT TO WASTE

FLYING FORTRESSES worth £37,000,000 stand staked in a field 25 miles south of Munich and will probably never fly again, writes Marshall Yarrow, *Reuter's* Special Correspondent.

Wing tip to wing tip and tail to tail, 450 of these warcraft lie in silvery lines on a lush Bavarian field, their mission accomplished.

They were used by the 8th U.S. A.A.F. to help hammer Germany into final submission. They remind one sharply of huge, shining eagles roosting triumphantly on the body of their prey. The long ranks of Fortresses are called by the G.I.'s around here "the Occupation Air Force." Theoretically, perhaps, that's what they are. But those in charge of it seem to have few qualms about the future.

They are guarded by only a few bored-looking soldiers, and it is doubtful if there are enough air crew within 200 miles to get them into the air. Already the first flurries of snow are dusting the countryside with whiteness. Six months out in the open will probably do to this army of Fortresses what the *Luftwaffe* could not do—ground them for ever.

I asked an American officer was there no remedy for this staggering waste.

"What can you do?" he countered. "They cannot be converted to transport or passenger planes. They are too expensive to operate. They have not the cubic capacity for cargo planes and, anyhow, their weight would militate against that. They were built for just one job—to carry a load of bombs. They did their job well—you just ask the Germans!"

Even the engines, apparently, are not worth salvaging. No peacetime air transport line wants to start out in business with second-hand engines, no matter how good they once were.

And so a king's ransom in unneeded aircraft stands parked on a southern German field—not even an airdrome—as a shining monument to the overpowering air superiority achieved by the Allies and a disturbing reminder of the industrial waste of war.

But an officer put me right on this. "Hell!" he objected. "They ain't wasted. Just take a look at all these soldiers living around here in peace and comfort. If we hadn't had all these ships we should still be fighting and a lot of these boys would be dead."

I had to agree that the £37,000,000 expenditure was not wasted in a humanitarian sense, but those acres of sparkling aluminium still looked like a lot of cooking utensils, vacuum cleaners, civilian automobiles, refrigerators and coffee pots to me.

However, I was assured that there is such a potential supply of new aluminium in the world that it would not be profitable to dismantle these retired aerial warriors for the amount of metal they would yield.

It did, however, pay to put them together—one more instance where the battle was the pay-off.

R.A.F. TO FLY MORE A.T.C.

MORE flights in R.A.F. aircraft for A.T.C. cadets will now be possible, under new instructions which the Air Council have just issued to the Commanders-in-Chief of all R.A.F. Commands at home. A new concession authorises R.A.F. station commanders to employ aircraft for the purpose of giving passenger flights to A.T.C. cadets whenever the aircraft and crews can be spared without interference with the ordinary work on the station.

Previously, cadets could only be taken as passengers by R.A.F. squadrons when space was available in aircraft engaged in ordinary duty flights. As flights will continue to be given to cadets on such routine duty flights as circumstances permit, the new concession means that passenger flying for the A.T.C. will be substantially increased. This increase in flying facilities is part of the new peacetime programme for the Corps, and it has been introduced because the Air Council find that "well conducted passenger flights can be of the greatest value to the efficiency and enthusiasm of the A.T.C."

Each of the 95,000 A.T.C. cadets has a personal flying and gliding log in which all his airborne training is recorded.

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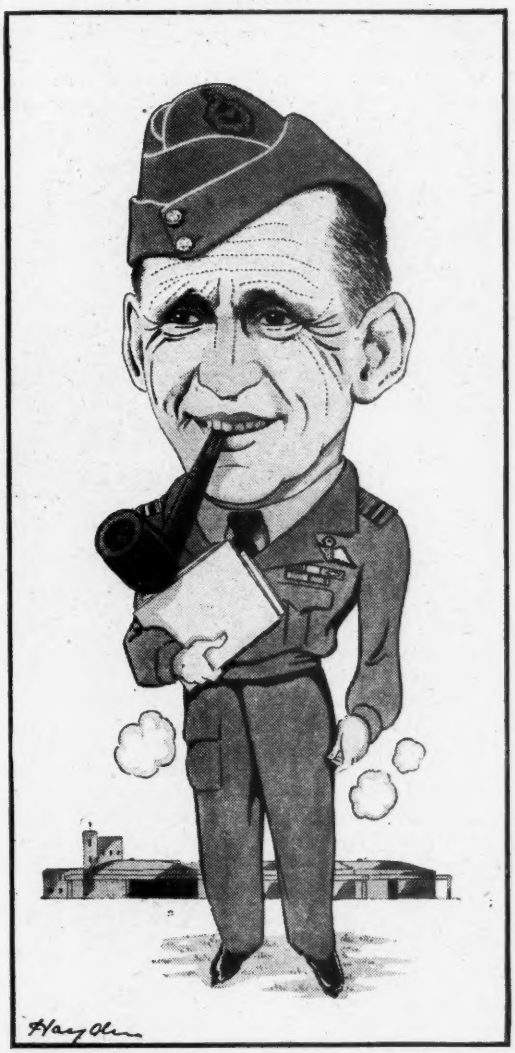
The New C.A.S.

Sir Arthur Tedder Succeeds Lord Portal as Chief of Air Staff

Caricature portraits by Hayden



Marshal of the Royal Air Force Sir Arthur Tedder.

TO be Chief of the Air Staff during a major war is a great responsibility and also a great privilege. For one thing, the C.A.S. does not merely control the Air Force, but he is also a member of the Chief of Staffs Committee, which has to advise the War Cabinet and to assist at conferences of the principal Allies. The retiring C.A.S., Lord Portal of Hungerford, G.C.B., D.S.O., M.C., was well qualified for these responsible duties, for he had graduated at the R.A.F. Staff College, had completed the Senior Officers' Course at the Royal Naval College, and had attended a course at the Imperial Defence College. Under his guidance the Royal Air Force grew into the majestic weapon which played so great a part in smashing the resistance of Germany. When Lord Portal enlisted in the Royal Engineers as a despatch rider in 1914 he can never have foreseen that 31 years later he would retire as the senior officer of a Service which did not then exist—and with a peerage to boot.

Marshal of the Royal Air Force Lord Portal.

The obvious successor to Lord Portal as Chief of the Air Staff was Marshal of the Royal Air Force Sir Arthur Tedder, G.C.B., who was lately Deputy Supreme Commander of the Allied Forces of Liberation. He is the only officer who has been granted the rank of Marshal of the Royal Air Force before becoming Chief of the Air Staff. Whereas Lord Portal started his military career as a Sapper, Sir Arthur Tedder entered the regular Army in 1913 as a 2nd Lieutenant in the Dorset Regiment, with a University commission from Cambridge. He, too, has attended a course at the Imperial Defence College. He was once A.O.C., Far East Command, but he first made his great name in the Mediterranean when the 8th Army advanced from Alamein to Tunisia. Now he will have to undertake the heavy task of changing the Royal Air Force from its wartime organisation into the form which it will have to assume in the coming years of watchful peace. That will be a very big job; but Sir Arthur has plenty of administrative experience behind him; and after all he has seen and done in the war he doubtless has very clear ideas of what he wants. They cannot be lightly disregarded by any Government.

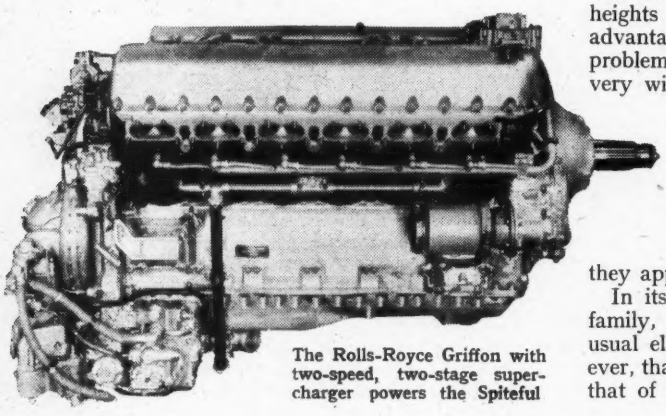
VICKERS - SUPERMARIN S

Spitfire Successor with Laminar-flow Wings and Rolls-Royce Griffon Driving Rotol Five-bladed Airscrew

RETAINING many of the features which have become so familiar through the long line of Spitfires, the new R.A.F. Spiteful fighter differs basically, from the aerodynamic point of view, from its predecessors in that it has incorporated in its design the new type of wing known as the "laminar-flow" type. Briefly explained, this means that, in order to avoid or, rather, delay, the onset of the setting up of shock waves, the aerofoil sections are much thinner than those to which we have become accustomed, and have a very "sharp" leading edge. Not only so, but the maximum thickness occurs at approximately mid-chord instead of at about one-third of the chord from the leading edge.

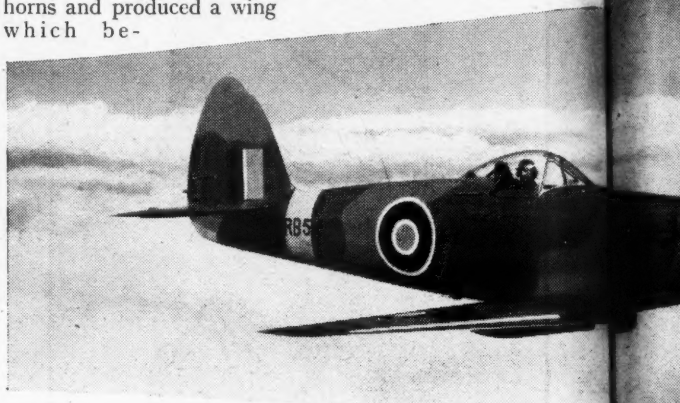
Practical Problems

From the aircraft designer's point of view, the laminar-flow wing is an unmitigated nuisance. A thin wing has to be made much heavier than a thick in order to bear the loads. There is little space inside it in which to house tanks, undercarriages, guns, etc. And from the production man's point of view, it demands greater accuracy in manufacture, coupled with a better surface finish. However, these handicaps must be regarded as the price to be paid for entering speed regions in which the speed of sound is approached, or even exceeded locally. The laminar-flow wing is the first step towards breaking through the compressibility wall, as Air Commodore Banks once expressed it.



The Rolls-Royce Griffon with two-speed, two-stage supercharger powers the Spiteful

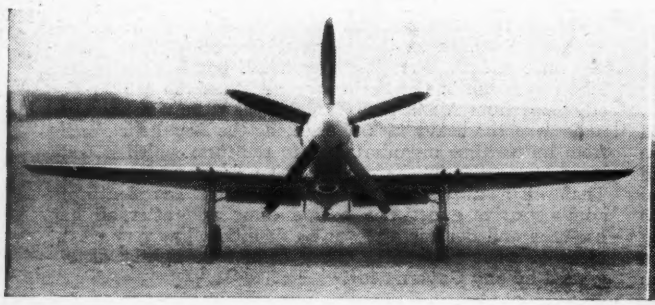
With its two-speed, two-stage Rolls-Royce Griffon 61 engine, the Spiteful is intended for operation at great altitudes, where compressibility sets in at much lower speeds than at ground level, and the designers of the aircraft section of Vickers-Armstrongs, Ltd., Supermarine works, have taken the bull by the horns and produced a wing which be-

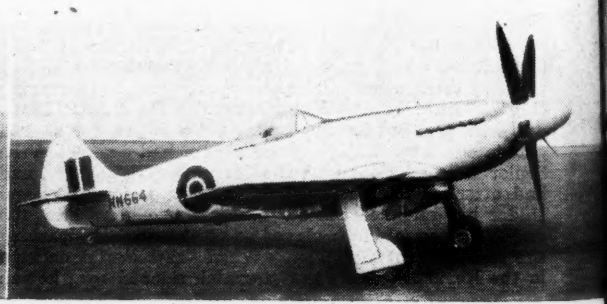


haves itself well at the greatest speeds reached. The maximum speed of the Spiteful, by the way, is in the neighbourhood of 460 m.p.h.

The two-speed, two-stage supercharger of the Griffon enables that engine to develop high power at great heights as well as at low. While this has its obvious advantages, it sets the airscrew designer some serious problems by demanding of him good efficiency over a very wide range of operating conditions. The Rotol engineers have met these demands with a five-bladed controllable-pitch airscrew, which gives good take-off and climb, and still has a high efficiency at the operational height. Five blades is about the maximum that can be accommodated on a single hub, and in the case of the Spiteful they appear to give excellent results.

In its general lines the Spiteful follows the Spitfire family, with a slim, well-streamlined fuselage and the usual elliptical tail surfaces. It will be noticed, however, that the wings have a plan form very different from that of the earlier machines. The elliptical shape has





N SPITEFUL

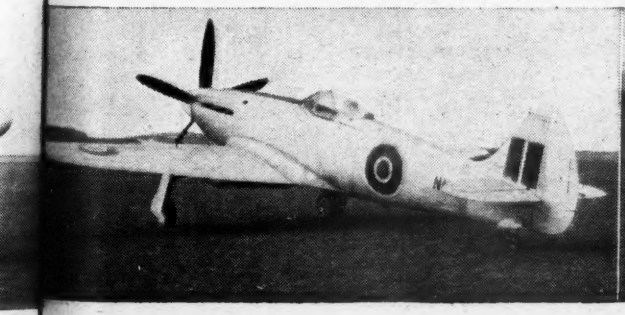
The two views below give a very good idea of the lines of the Spiteful F.XIV. That on the left shows the very thin wing and the good view obtained by the pilot, while that on the right brings out the new plan form with straight taper and square tips.

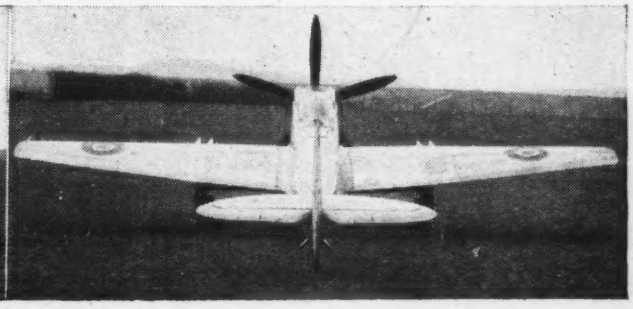
been replaced by wings of straight taper and with square tips. The undercarriage folds inwards so that the wheel track is very much wider than that of the Spitfires. Two advantages follow from this arrangement: Greater stability on the ground and easier undercarriage stowage, the wheels resting in the thickest part of the wing.

A new cockpit layout has been adopted in the Spiteful, not only with the object of bringing the various controls and instruments into better positions, but also arranged to support the pilot in such a way that he is enabled to withstand the accelerations imposed by high-speed manœuvres. The cabin top gives the pilot an excellent view, and is of good aerodynamic form.

With a loaded weight of about 9,000 lb. and a wing

Span	35ft.
Length	32ft. 7½in.
Height	13ft.
Wing area	210 sq. ft.
Weight	About 9,000 lb.
Speed	Over 460 m.p.h.





VICKERS-SUPERMARINE SPITEFUL

The official silhouette of the Vickers-Supermarine Spiteful. The elliptical Spitfire wing has disappeared in this latest Supermarine fighter.

In spite of a wing loading of nearly 43 lb. per sq. ft., the Spiteful is very manœuvrable. Its top speed is 460 m.p.h. and maximum rate of climb nearly 4,000 ft. per min.

area of only 210 sq. ft., the wing loading of the Spiteful is close upon 43 lb./sq. ft. In spite of this, however, the machine is very manœuvrable. Armament comprises four 20 mm. cannon housed in the wing.

It may be recollected that at the recent demonstration of naval aircraft at Heston, one of the machines shown was the Seafang, which is the Navy's version of the Spiteful, and differs from it chiefly in having an arrester hook and hinged wings for folding, the operation being power-driven so that the pilot can fold the wings himself while taxying towards the lift of the aircraft carrier.

A.I.D. TEST HOUSE

(*Continued from page 476*)

are located was, during its construction, completely bonded, and a one-inch mesh steel screen, also bonded to the steel work, was embodied in the concrete floor.

The Textile Laboratory is particularly interesting in view of the fact that every type of textile used in aircraft and auxiliary equipment is the province of this laboratory. It is conditioned to 70 deg. F. with 65 per cent. relative humidity, and equipped with a Dennison tensile testing machine in addition to a rather interesting and novel piece of apparatus for measuring the airflow rate through parachute fabric (which nowadays is exclusively Nylon). The norm is 12 cu. ft. of air/sq. ft./min.; should the flow rate be much in excess of this, a parachute made of such fabric would descend too quickly—conversely, if the flow rate was very much less the parachute might easily "burst" if opened at a fairly high velocity, such as might be the case when baling out from a modern fighter.

Strength tests are also carried out on the sails of aircraft dinghies to ensure that they will not burst or split in a gale of wind. The dinghies' lifelines are also tested for strength and for buoyancy, whilst, to complete the picture, the rubberised fabric of the dinghy itself is tested for porosity by clamping a test piece in a special tank to form a diaphragm subject to hydrogen under pressure below and having water above; thus any leakage through the fabric will be shown by hydrogen bubbles in the water.

In conclusion, one cannot help reflecting that the intensive nature of the A.I.D. inspection in all spheres is by no means the least important factor in ensuring the supreme quality of our aircraft, and, so long as the standard of inspection tests is maintained at its present high level and is backed by the resources of Harefield, no one need fear that British aircraft may be built to a lower standard of quality than has obtained in the past.

EPIC STORY NOT YET TOLD

AIR CHIEF MARSHAL SIR PHILIP JOUBERT, former Officer Commanding Coastal Command, said at the Rotary Club of London recently that Coastal Command did not have sufficient aircraft to do its job properly until 1943-44.

To ensure that U-boats were kept at bay in what was "a very big parish," squadrons had to be transferred from one point to another according to where danger was most acute.

"The story of Coastal Command," said Sir Philip, "is a dramatic one, a story of endurance, courage and skill of men who saved Britain from starvation. It is an epic story which cannot yet be fully told, but some day it may, and then you will realise how much the men of Coastal Command deserve your thanks."

In the Air III

Two American Heavies

Impressions of the Fortress and Liberator : The Third of a Series of Short Articles Dealing, from the Pilot's Angle, with Well-known Types

By INDICATOR

DESPITE tidy and rational cockpit layouts, American aircraft often tend to give the pilot who has been brought up on British types something of a headache when dealing with the "drill." The cabins of big aircraft, in particular, are strangely unlike their British counterparts, though easy enough once a memory system has been perfected to cover one during the more critical stages of a flight. At least in their earlier forms, the Fortress and the Liberator were particularly demanding of strenuous mental attention, with their turbo-blowers and their ingenious mixture of electric and hydraulic services.

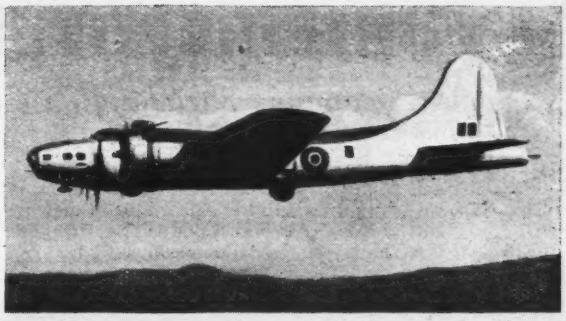
The Liberator, in fact, has been, in my experience, the only aircraft for which a memory system could more effectively be replaced by a purely visual check up and down the massive control pedestal. There are so many "extras" to be included, such as the control lock and the hydraulic booster pump. I mention these two because they are un-English and of vital importance. The former is normally kept, for reasons of comfort, in the locked position until the aircraft is actually taxied on to the runway, and it *could* be forgotten in spite of the strap holding it up. At least one accident has been caused by a failure to remember even the booster; in this the pilot, after landing, absent-mindedly stopped the motors which carried the hydraulic pumps, and, as the booster motor wasn't functioning, there was no pressure for the brakes. The outfit rolled quietly into a hangar.

A Matter of Loading

Although generally similar in duties, no two aircraft could be so dissimilar in handling qualities as the Fort. and Lib. While the former is a flying machine from start to finish, the latter only begins to feel like one after it has been wound up to cruising speed. The Fort. floats off like a flying machine of the old school, while the Lib. should be hauled into the air, where it stays, from the feel of it, largely by virtue of several thousand horses and at an uncomfortable angle until it has gathered more speed. Again, the Fort. goes on flying until it is three-pointed, and even afterwards, while the Lib. arrives like a controllable and amply-powered cartload of bricks, and has a considerable rate of sink at low approach speeds.

Just a matter of wing-loading and general design; I'm not complaining—the Liberator is the "modern" kind of aircraft, and we have learnt to like it that way. One almost feels that an intelligent flight engineer, with the handling notes on his knees, could take it up and bring it down again safely. With a tricycle undercarriage there is little tendency to deviate from the straight on take-off, and even that little can be held on the rudders; when the A.S.I. says 105 m.p.h. or so, according to load, you pull hard to make it fly; and the approach is a matter of holding a more or less constantly steady (or steadily reduced) speed while the boosts are slowly brought back to lose height until the moment when the wheels touch. Travelling from A to B is a straightforward combined problem of navigation, meteorology, and applied mechanics. And all bumps seem to be "down" bumps.

The Fortress, on the other hand, has more than once been said to behave like a four-engined Anson—a description which fairly adequately covers it. One feels that liberties can be taken with it, and it is flying right down to its stalling speed in the good old-fashioned way. Because of its comparatively small flap and ground angles it both floats and runs a long way if brought in too fast, and the enormous fin area makes it something of a handful in a strong cross-wind. But it offers no new problems to the pilot brought up on multis. Incidentally, I have often wondered why no other manufacturer has used the Fortress "two-barred gate" throttle system by means of which all four engines can be handled as two, and so that the two outers can be used separately for taxying.



ANGLICISED : The two entirely dissimilar but equally useful American "heavies" in Coastal Command guise.

Perhaps the Englishman, so independent in so many ways, thinks always of control layouts from the "solo" point of view. Maybe he doesn't trust his second pilot or his flight engineer, and likes to feel that he can, if necessary, get round to everything. So he can, even in American heavies, though it's a bit of a stretch and, in the Fortress, one is liable to fumble with the wrong switch—and such a small switch it is for the massive undercarriage.

In fact, with a good and reliable partner, the driver can just sit back and rap out orders, or make strange signals during the whole process of taking off and coming back again. After the initial opening to get the outfit bowling straight and to hold any incipient swing, even the throttles can be taken over by the second pilot, who is much better able to set them to the required boost. At one time it was usual for the flight engineer or second pilot to scream out the boosts as the captain moved the throttles open, and to grab them as the limits were being neared; in just the same way he would sing out the indicated speeds during the approach, so that there was no need for the captain to take his eyes off the runway. Quite a melodramatic affair it was: "Twenty inches, twenty-five, thirty, thirty-five, forty. . . . I've got 'em" for the take-off, and "one-thirty, one twenty-five, one-twenty, one-fifteen, one-fifteen. . . . Hold it" for the approach.

Problems of Demobilisation

Some Commands Shrinking : Others Maintaining their Numbers

By MAJOR F. A. de V. ROBERTSON, V.D.

FROM some points of view the sudden submission of Japan was a nuisance to the Allied Forces, and not least to the Royal Air Force. Of course, everyone was delighted to think that the Allies would suffer no more battle casualties, and the staff of Admiral Mountbatten would certainly not grieve unduly because its elaborate plans for the invasion and liberation of Singapore and Malaya could be consigned to the waste paper basket. But, whereas when there is fighting ahead with the object of "wiping something off a slate" (as Kipling once wrote) and setting free our tortured fellow countrymen who were prisoners of war or internees in the hands of the Japanese, the troops may be reckoned upon to go in with enthusiasm, there will almost certainly be a feeling of anti-climax when no enemy lies ahead in their path.

Yet the "cease fire" has brought no relaxation of the responsibilities of A.C.S.E.A. (Air Command, South-East Asia), but rather an extension of them. Everyone had looked forward to a gradual, step by step, mastery of all the lands which the Japanese had overrun. Then, in one moment, all these lands were thrown on the hands of the South East Asia forces. It was certainly embarrassing. A.C.S.E.A. was already spread over an enormous tract. In addition to Burma, India, and Ceylon, it had control over contingents in Mauritius, the Seychelles, Madagascar, Aden, etc. It suddenly became responsible for air control in Siam, Indo-China, Malaya, Hong Kong. It is to send a contingent to join the Allies' forces occupying Japan. The Netherlands East Indies cannot be disregarded, and the widespread disturbances in Java add to the other reasons why at this moment British air power in the Far East cannot be suddenly reduced.

It must not be overlooked that the contingents of the U.S. Army Air Forces, which had given yeoman help in the reconquest of Burma, were all withdrawn before VJ Day, and that the air squadrons left under the supreme command of Admiral Mountbatten, and actually under Air Chief Marshal Park, now all belong to the British Empire.

Mediterranean and Middle East

The other operational Commands of the R.A.F. are being steadily reduced. Air Chief Marshal Sir Guy Garrod is head of the Command known as MEDME, which includes the Mediterranean and the Middle East. He has his headquarters in Italy, but is shortly to transfer them to Cairo. The Middle East is still a Command, though a subordinate one, and it still includes Iraq, Palestine and Transjordan, Aden, East Africa, and the Sudan, as well as the R.A.F. in Egypt. The Air Force in those countries, as well as in Italy and North Africa, is being reduced, and demobilisation is in progress. Presumably the Middle East will soon regain its independence. The three operational Commands at home (Bomber, Fighter, and Coastal) have already reduced their numbers. Incidentally, what used to be the Balloon Command is now part of Fighter Command, which is only sensible.

Three other Commands remain large in numbers, and are likely to remain so for a considerable time yet. Transport Command is now bigger than it has ever been in the past, and the reasons for that are fairly obvious to everyone who considers the matter. It is one of the great agencies for expediting the demobilisation of other Commands. It has increased its numerical strength in order that others may reduce theirs. Of course, that does not mean that no man is demobilised from Transport Command; but it does mean that there must be intakes as well as outgoings. Those who are allowed to go must be replaced, and the aircraft flying out to the East do not go empty. Some of the outward passengers may be civil officials who are going to take over care of Burma or Malaya. If they fly out they save time (which may be very important in their case), and air transport also relieves some of the strain on shipping. Still the largest commitment of Transport Command is bringing home men for demobilisation from the East. Its services are at the disposal of the Navy and Army as well as of the Air Force. No distinction is made. One demobilised man is as dear to his country as another, whichever the Service to which he may have belonged.

Commands Still Busy

The Maintenance Command is also keeping up its strength. It is not likely to shrink for some time yet. Those who are impatient for demobilisation and can think of nothing else may cry that the war is over and that all material not wanted for the peacetime Air Force ought to be chucked on to one big bonfire. Such people forget that Britain has been grievously impoverished by the war, and needs to re-create her trade. Of the warlike material accumulated there is much which can be sold with advantage at home, and much more which can be exported. To throw it all on to a bonfire would be wicked waste. So Maintenance Command is busy sorting the stuff and preparing to dispose of it to the best advantage. This inevitably postpones the day when the Command can afford to reduce its numbers substantially; though the natural process of discharge and replacement of individuals goes on.

Technical Training Command is another which as yet is unable to reduce in numbers, and it is the case in which it is most difficult to balance consideration for individual men against the necessities of the public service. While the war was still in progress it was the obvious policy to use the older men in domestic and administrative trades, while the younger ones joined air crews or ground crews or some other active job. Accordingly, if all demobilisation were to go exclusively according to age, the clerks and sedentary trades workers would vanish from the R.A.F. Now, if a station is to be closed down, the last men to leave must be the clerks and cooks and administrative trades. Men must be fed up to the moment when they depart, and they must get their pay and all the necessary papers, which it is the duty of the administrative staff to prepare. So, when these men are demobilised, they must be replaced. Now that the fighting is over, there is no reason why younger men should not be employed in these trades. Again, the detailed needs of the Service have altered owing to the collapse of Germany and Japan, with the result that there are surpluses in some trades and shortages in others. A large programme of retraining has, therefore, had to be arranged to meet this reshaping of the Service for its new duties, and also to provide replacements for those in Overseas Commands. Men from the air crews and ground crews are being trained to replace the older men with longer service who are demobilised. Probably they very much dislike the change, and one can sympathise with their feelings. Many officers have had to be chained to desks throughout the war who would much have preferred to be on operations. The public service is an overriding consideration. Moreover, there must be replacements in other Commands. So Technical Training Command is still busy turning out men for the jobs which must be filled. Even in time of peace that Command is always busy supplying the normal needs of the R.A.F., and that necessity still exists. At the same time it is still labouring under the influence of the war, and in its own way is helping to speed up the demobilisation in other Commands. Flying Training Command, however, has already shrunk.

Science and Industry

Centenary Celebrations of Imperial College of Science and Technology

LAST Thursday their Majesties attended a ceremony at the Albert Hall in celebration of the centenary of the Imperial College of Science and Technology, and by so doing called attention to an event of national importance. "South Ken." in many spheres has come to mean instruction in the application of science to industry, and it will come as something of a surprise to many that a century has elapsed since the beginnings of the Imperial College in the form of the Royal College of Chemistry, founded in October, 1845, under the very active support of the Prince Consort. Other institutions followed, and in 1907 these were brought together by Royal Charter into the Imperial College.

To readers of *Flight* the Aeronautics Department is of most direct interest. This provides a one-year course in aeronautical science and engineering for students who have already graduated in engineering, physics or mathematics, and offers facilities for work in aeronautical subjects. The post-graduate course includes instruction in aerodynamics, theory of aircraft structures, aircraft design, aircraft instruments, and piston, turbine and jet-propulsion engines.

Lectures are supplemented by laboratory and drawing office work. The Diploma of the Imperial College (D.I.C.) is awarded to students who are successful in reaching the standards set for the course. This year 35 students are taking the post-graduate course in aeronautics.

The library of the department contains aeronautical literature from all parts of the world, and the laboratory facilities include wind tunnels, a smoke tunnel and a tank.

In connection with the centenary celebrations the laboratory of the Department of Aeronautics in the City and Guilds College was thrown open to visitors on Friday and Saturday of last week and demonstrations were given of the work done in the various tunnels.

In the 5ft. by 4ft. wind tunnel there were demonstrations of how the airflow over an aerofoil changes when the wing stalls, of the research equipment used for work on compressible fluids and on wing flutter, and, in the same room, of equipment used for demonstrating to students of the post-graduate course the basic principles of aircraft structures.

The 2ft. tunnel was used for showing the effect of wing flaps and how they increase lift for landing. Airflow around typical bodies was demonstrated in the smoke tunnel, and on view was other apparatus used for explaining basic principles of aerodynamics to students. In the water tank was shown vortex motion at the tip of an aircraft wing.

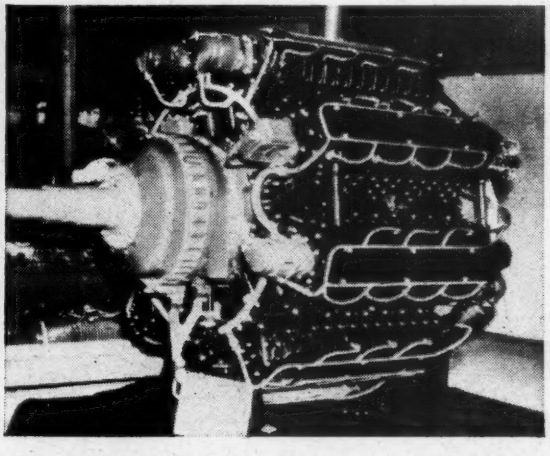
Working models were included in the exhibition of aircraft instruments, including gyroscopic and navigational instruments and instruments for measuring air speed and altitude. Scale models of complete aircraft types were also shown, and on the walls were photographs of large wind tunnels indicating the extensive and expensive plant needed for the development of modern aircraft. The library of the Aeronautics Department contained photographs of aircraft and aircraft engines, and pictures taken during research work on high-speed flight.

GOLD MEDAL FOR PROFESSOR BAIRSTOW

AT its last meeting the council of the Royal Aeronautical Society unanimously decided to award the Society's Gold Medal, and Honorary Fellowship, to Professor Leonard Bairstow on his retirement from the post of Zaharoff Professor at the University of London in recognition of his long service to aeronautics. Professor Bairstow is the first man to receive both these awards.

The name Leonard Bairstow is, perhaps, less familiar in British aviation now than it was some years ago. As Zaharoff Professor of Aviation in the University of London and Director of the School of Aeronautics at Imperial College, Professor Bairstow had few direct contacts with the wider circles in the industry, but his work has been of great educational value. In the earlier days, through the National Advisory Committee for Aeronautics (before it became the Aeronautical Research Committee) Professor Bairstow was a familiar figure, and at the Royal Aeronautical Society's lectures he frequently took part in discussions. His association with the Imperial College of Science and Technology, which celebrated its centenary last week, was a long one, his technical education beginning there as long ago as 1898 and terminating as Director of the School of Aeronautics.

British aviation will applaud the Royal Aeronautical Society's award and wish Professor Bairstow happiness and contentment in his well-earned retirement.



The 36-cylinder, 5,000 h.p. multi bank radial engine designed by Lycomings for the U.S.A.A.F. It is said to weigh only 5,500lb.

TECHNICAL AND SCIENTIFIC REGISTER

FOR the special benefit of demobilised men and returned prisoners of war who are scientists, professional engineers, architects or surveyors, the Ministry of Labour and National Service have asked us to invite attention to the service provided by their Appointments Department's Technical and Scientific Register at York House, Kingsway, London, W.C.2. (Telephone: Temple Bar 8020.)

A technical staff, competent to give advice and assistance, has been augmented to meet problems of settlement and reconstruction. A large variety of vacancies, both at home and overseas, is now available for fully qualified scientists, engineers, etc. Enquirers are particularly asked to write or 'phone for appointments, stating occupation, qualifications, and the purpose of the proposed visit so that they will not be kept waiting when they call.

LOWER ACCIDENT RATE

DURING the past 12 months the accident rate for R.A.F. Transport Command has decreased. This fact was emphasised by Mr. John Strachey, Parliamentary Under-Secretary of State for Air, in a written answer which he gave Mr. Gamman (Con., Hornsey) last week.

Since July 1st the total passenger mileage for the Command has nearly doubled, Mr. Strachey said, and has now reached the figure of 190,000,000 passenger miles a month. On the extensive schedules and services there were four fatal accidents involving the death of 18 crew and 18 passengers, and these figures represent a passenger fatality rate of 1 in approximately 13,000,000 passenger miles. Total number of accidents involving injury or death between July 1st and October 15th was 24.

"It is only right," added Mr. Strachey, "to look at these casualties against a vastly increased commitment, and in fact the accident rate has fallen over the past year."

CIVIL AVIATION

British South American Plans

Shipping Interests Preparing for Unsubsidised Operation with Lancastrians

THE idea of operating a British air service to South America has always been an attractive one, and plans to this end have been made more than once It may be remembered that British Airways, in 1938, were ready to proceed with such service had permission been obtained and conditions been suitable, and as long ago as 1919 the Royal Mail Lines were taking an interest in such a project.

More recently a number of shipping companies, five in all, have combined with the idea of running an unsubsidised service to Buenos Aires and elsewhere in South America. Recently renamed British South American Airways, this concern is now almost ready to begin operations and these will be started as soon as possible after the publication of the Government White Paper, which is expected on November 1st Aircraft have been purchased, crews have been collected and are being trained, and the general organisation has been provisionally completed.

Until such time as Avro Tudor IIs are available, B.S.A.A. will use Lancasters, which will be converted by the manufacturers into the equivalent of Lancastrians and will have a passenger capacity of twelve. Not unnaturally, since the general manager is Air Vice-Marshal D. C. T. Bennett, the initial crews have been largely or completely made up from released or about-to-be-released members of the R.A.F. Pathfinder Force, and these crews are now undergoing intensive navigation and other retraining to suit them for a new kind of operational flying. The services of one of the more experienced airline pilots, Capt. Gordon Store, has been obtained to look after the operations generally, while the selected personnel for equipment and maintenance organisation are largely composed of ex-Service officers.

The pseudo-Lancastrians, if so they can be described, are expected to cruise at 235 m.p.h. and will make the Hurn-Lisbon-Bathurst-Natal-Rio de Janeiro-Montevideo-Buenos Aires run in a flying time of 35 hours. Decisions have not yet been reached in the matter of frequency of service or in the actual overall time for the scheduled runs, since everything will naturally depend on the degree of assistance and organisation obtainable at the various stopping points.

Following the Pan-American announcement of their proposed Atlantic fares, it is interesting to learn that those for the British South American Airways services are comparably (if accidentally) low for such a considerable journey. The single fare from this country to the Argentine will be £155—a figure which has been worked out on an estimated all-in operating cost of 4½d. a passenger statute mile. The company does not necessarily consider that these fares, with initial service frequency, will permit a profit, handsome or otherwise, to be made, but the figure has, as far as possible, been worked out on known operational costs.

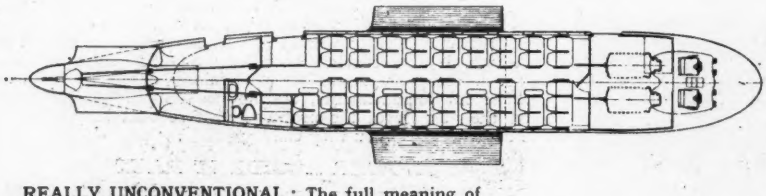
B.S.A.A. is, in itself, merely an airline-operating concern, and the shipping interests involved are not proposing to interfere at all with the practical side of the organisation. Nevertheless, the fact that these interests already have a thorough organisation for traffic and necessary local "diplomacy" purposes will help to keep the all-in operating cost down and enable the operations to be started without the necessity for the preliminary staffing and organisation of traffic offices on the route. By way of record, it may be again noted here that the shipping companies concerned in this venture are: Royal Mail Lines, Blue Star Line, Pacific Steam Navigation, Booth Steamship and Lamport and Holt Line, with Mr. W. J. Booth as the chairman of the company.

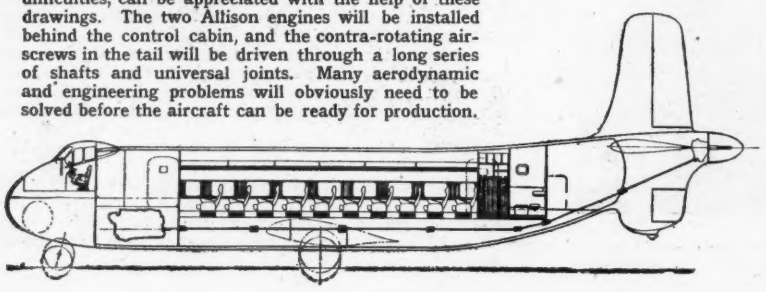
For the moment Buenos Aires will be the final South American terminal, but it is hoped that extensions may duly be made to other South American centres. At the time of writing, the B.O.A.C. Lancastrian carrying, amongst others, two representatives of B.S.A.A., has reached Lima, in Peru

ANSONS FOR R.A.S.

PENDING the delivery of their Vickers Vikings, the first of which should be available early next year, Railway Air Services have ordered a number of 7-9-passenger civil Ansons, or Avro XIXs, for their internal routes. Following experimental runs with this type, R.A.S. have decided, when these aircraft are delivered early this month, to use them on the London-Belfast and Glasgow-Belfast routes. The former service will then be operated non-stop in a flying time of little over two hours.

The Vikings were presumably ordered at least partly on the assumption that Railway Air Services' routes will be duly expanded, following the plans laid by the last Government, to include a European network. The first Vikings to be delivered will take the place of the Ansons on the non-stop internal services.





REALLY UNCONVENTIONAL: The full meaning of the Douglas DC.8 project, in terms of possible technical difficulties, can be appreciated with the help of these drawings. The two Allison engines will be installed behind the control cabin, and the contra-rotating airscrews in the tail will be driven through a long series of shafts and universal joints. Many aerodynamic and engineering problems will obviously need to be solved before the aircraft can be ready for production.

EUROPEAN BUILD-UP

THE return to normal conditions is again foreshadowed by the opening of a S.A.B.E.N.A. special service between Brussels and London, the first of which duly arrived at Croydon last week, carrying the Belgian Minister of Communications, M. Rongvaux. Lockheed Lodestars will be used. The last regular S.A.B.E.N.A. service between Belgium and this country was that to Shoreham on May 9, 1940, the eve of the invasion of the Low Countries.

During the same week, as already recorded, Air France reopened their London-Paris service, while Swedish A.B. Aero-transport already operates between Croydon, Götesborg and Stockholm, Danish D.D.L. between Blackbushe (Hampshire) and Copenhagen, and Swissair between Croydon and Zurich. The passengers on all these "semi-civil" services pass through the B.O.A.C. traffic centre at Victoria, which is consequently very much busier in appearance than the pessimistic general view of civil aviation might have led one to expect. Altogether something like 1,800 passengers are handled every week by Airways House.

TRANS-CANADA

TRANS-CANADA AIRLINES have, we learn, taken delivery of their first D.C.3s, and plan to use these three, bought from the United States Surplus Supply Board, for the Toronto-New York and Montreal-Ottawa-Toronto-Windsor runs. Seven more have been ordered from the manufacturers.

According to a recent report, well over half the total revenue of T.C.A. is now supplied by passenger traffic. This revenue has climbed from 35 per cent. of

CIVIL AVIATION NEWS

the total in 1940, to 54.4 per cent. so far this year.

In preparation for Atlantic services, T.C.A. has established a liaison officer in London to facilitate priorities for paying passengers now carried on the converted Lancasters used between Montreal and Prestwick.

The T.C.A. president announced recently that a service was planned across the North Pacific to Russia and China. This, in addition to services to Australia and New Zealand, to the West Indies and South America, and its transatlantic service. Canadian-built Douglas DC-4s will be used on the routes.

ROUTINE CROSSINGS

IN the midst of all the trumpetings about the various Atlantic services, people in this country and elsewhere are liable to forget the years of routine Atlantic flying completed by B.O.A.C. with their North Atlantic Return Ferry. While, at the moment, and because we have no available landplanes, the regular passenger service has had to be shifted to the Southern route for the winter months, and at least two American companies are starting services, the B.O.A.C. Return Ferry over the North Atlantic has been carrying on.

September 25, in fact, marked the fourth anniversary of this service, in which a daily schedule in each direction had long since taken the place of the original "flights when possible" programme. During last winter, thanks to the exceptionally good weather characteristics of the Prestwick base, there were only three cancellations

While the U.S. companies have, for the time being, the monopoly of the winter North Atlantic, it will be as well to remember this ferry service and the fact that it was B.O.A.C. who really pioneered the North Atlantic route.

FRENCH SOUTH ATLANTIC SURVEY

AFTER two false starts—the first on October 10th when the hull was damaged during take-off, and the second on October 23rd when the aircraft returned with engine trouble—the prototype Latécoère 631 flying-boat *Lional de Marmier* left Biscarosse on October 24th and reached Rio de Janeiro the next day after a refuelling stop at Port Etienne. According to reports there were 24 observers and other passengers aboard in addition to a crew of 19, so that a two-stage flight of 5,500 miles give some idea of the big Latécoère's capacities.

AMERICAN EXPORT MAKE A START

DURING last week two Douglas Skymasters of American Export Air Lines made a preliminary Atlantic run in preparation for their planned thrice-weekly services between La Guardia, New York, Rinneana and London. One of the two Skymasters made a quick turn-round and flew back to the U.S. via Iceland and Newfoundland, while the second Skymaster came into Hurn, Bournemouth. Attempts have been made to obtain permission to use either Bovington or Northolt, but without success, and the failure was particularly troublesome since the aircraft had developed a minor hydraulic fault which could not be dealt with at Hurn. The assistance of Scottish Airways was obtained, and the necessary part was brought down from Prestwick.

Amongst other passengers brought over by the Skymasters were Mr. James Eaton, Vice-President of American Export; and Mr. Charles Spears, Vice-President of American Airlines. The run was completed more or less to schedule despite the extremely rough conditions on this side of the Atlantic—conditions which caused the *Queen Mary* to anchor off the Needles on her way home.

For the moment, at least, American Export propose to continue to charge the same fares—$572 for the single trip—as were charged while Sikorsky S-44 boats were being used. When the Skymasters are replaced by Constellations the position may be reconsidered. Since only a comparatively small payload can, in the best of circumstances, be carried over the Atlantic, the fare-rate can be adjusted only on a basis of final utilisation and frequency. American Export are, of course, now part of the American Airline System, and the name for the section running the European services will duly be changed to American Airlines Overseas Division.

FARE TROUBLE

PAN AMERICAN AIRWAYS have so far been refused permission to start their initial Atlantic services. As might have been expected, the Civil Aeronautics Board have withheld their blessings on the grounds that the company failed to give the required 30-day notice of fare revision.

CONSTELLATION PRELIMINARIES

WHEN the production Lockheed Constellation appears in service it will be interesting to remember that preliminary ground design checks were probably used more extensively during its development than with any other aircraft.

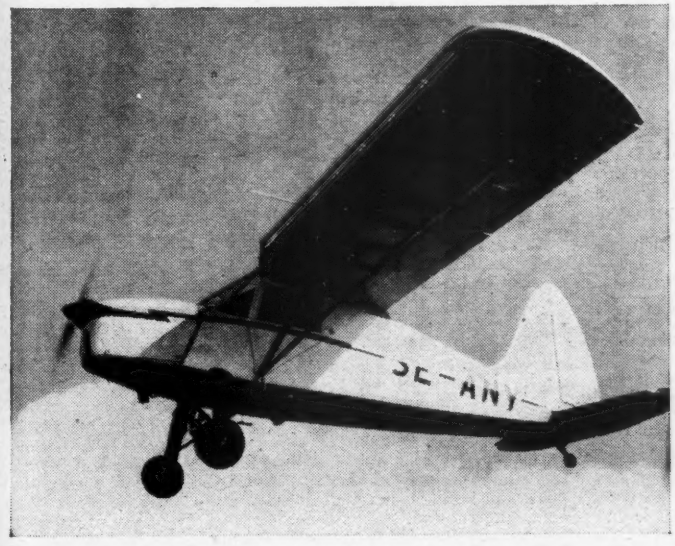
Whether or not the considerable time gap between the flight of the prototype and the appearance of the first production examples has meant that a great deal of further practical development was necessary, the bulk of the really basic development work was carried out before this prototype had been completed. Test runs in six different wind tunnels, for instance, were used in the course of airflow investigations, and the Lockheed people claim that not a single external change has had to be made to the aerodynamic design of the prototype. A full-scale power mock-up of the entire hydraulic system and general plumbing arrangements was made, and test rigs were used to investigate vibration frequencies and study stress effects in various parts of the structure. Later on, the prototype itself was installed with a series of water tanks for different load tests, the water and consequent loads being shifted about the aircraft by a system of pipe lines.

Apart from the use of hydraulic power boost for the controls—which, apart from the obvious control-lightening advantages, permits the use of smaller control areas, narrower shroud gaps, and simplifies the direct areodynamic problems—the Constellation will probably be the first civil aircraft in service to be fitted with a thermal de-icing system and cabin pressurisation.

CONVENTIONALLY INTERESTING

A REMINDER of the almost forgotten days of Puss and Leopard Moths is the Danish K.Z.III, which, strangely enough, is at present being sold to private owners and others in Denmark and Sweden while we go without. It is of composite construction, the fuselage of steel tube and the wing of wood. A comparatively high cruising speed for the type—106 m.p.h.—is coupled with a landing speed of 34 m.p.h. obtainable with the help of high-lift flaps and slots covering the entire leading edge. The manufacturers claim that it continues to be controllable at and below the stall. The engine used is one of the new Cirrus Minor II series.

At the moment the K.Z.III is being produced in two-passenger form, but a three-passenger version is on the way. The initial production by the manufacturers, K.Z.-Aero, Ltd., is for a hundred of these machines.



The Danish K.Z.III which is being sold in Denmark and Sweden.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THRUST AND GROUND SPEED

Effect of Headwinds on Jet-propelled Aircraft

HERE is a query which will probably amuse the No. 8 Hats, but which I imagine may have presented a little problem to many of *Flight's* less technical readers. It is simply this: Does a headwind have the same effect upon the ground speed of a jet-propelled aircraft as upon one driven by an airscrew?

The question is prompted by the reflection that whereas an airscrew exerts its thrust upon the air, the jet unit's thrust is pure reaction exerted within the aircraft and quite independent of the medium in which the aircraft is moving. Theoretically, an airscrew operating in a vacuum can exert no thrust because it has nothing to push against, but a jet unit can because (in the words of the immortal "Horace," was it not?) it "pulls itself up by its own braces."

A beam wind will, of course, produce the same drift for the same airspeed of both types, but it seems to me that in a headwind the airscrew is thrusting against something that is already moving in the opposite direction in relation to the ground and thus part of the power exerted is used up before the aircraft begins to move forward in relation to the ground. In a jet-propelled aircraft, however, the whole of the thrust exerted is transmitted, through reaction, to the aircraft to drive it forward. Surely, then, if the power-output and the L/D ratio are the same in each case, the ground speed of a jet-propelled aircraft will be greater against a given headwind than that of one driven by an airscrew.

After all, is it reasonable to say in one breath that a jet-reaction unit exerts its *thrust* independently of the surrounding atmosphere, and in the next breath claim that the result of the thrust is affected by the movement of that atmosphere over the earth?

No "Aerobatic equations," please! Tell me in simple words.

TYRO.

TWIN TRAINERS

Landing Technique with the Oxford

I SHOULD like to correct the impression that "Indicator" gave in his article in your last copy of *Flight* when he stated that wheel landings are unfortunately taught at A.F.U.s using Oxford aircraft.

In point of fact three-point landings are taught throughout the five weeks' period of day flying that pilots carry out on the A.F.U. course. During the two weeks' period of night flying it is not considered essential that three-point landings be taught, as the tail-down type of wheel landing on the Oxford is equivalent to a three-point landing on all twin- and four-engined Service type aircraft, except, of course, tricycle undercarriage types. This is purely to minimise the risk of damage caused by the comparatively quick drop on to three points if the aircraft is held off too high on landing, which is a common fault during the earlier stages of night-flying training.

"Indicator" also mentioned that the thumb must be on the brake lever ready for use during a three-point landing, or at the end of a wheel landing. The method taught at A.F.U.s is to use opposite engine to correct any swing that may develop; this method is usually quite successful, the brake to be used only if absolutely necessary, thus eliminating any risk of nosing over due to excessive use of brake.

H. D. ROGERS.

["Indicator" writes: "My remarks on A.F.U. landings were based on visual evidence rather than on any knowledge of what should be taught. I accept the correction. As for holding post-touch-down swing on the engines, this may be excellent in theory, but I never found the urge obtainable (particularly at very low speeds with fixed-pitch airscrews) to be sufficient to deal with deviations other than those of a very gradual nature."]

CAMPAIGN AWARDS

Designed to Commemorate Victories

I HAVE for weeks past read with mixed feelings the opinions of your correspondents upon the award of campaign stars to aircrew personnel. May I endeavour to reply to these and also support Flt. Lt. Werner (*Flight*, October 11th)?

Most of your correspondents do not realise that the campaign stars are to commemorate a decisive victory by our Forces, and as such are issued to personnel serving in those Forces up to the time of victory. The Aircrew Europe Star is no exception. All your correspondents have forgotten that, for 4½ years, a desperate battle raged over the skies of Europe. Upon the battle depended the outcome of all battles. So as the man of the 8th and 1st Armies received recognition by the Africa Star, those aircrew who participated in the longest battle of the war and gained unquestionable victory over the *Luftwaffe* before D-Day receive their recognition with the Aircrew Europe Star.

I feel sure that a man who joined the 8th Army after the fall of Tunis would not dream of claiming the Africa Star. I cannot, therefore, agree with "Celer" (*Flight*, October 11th), who apparently considers that all aircrew should wear the Europe Star which commemorates a victory achieved before they took up operational flying. Neither do I agree that the opposition after D-Day was heavier than before, and I am sure statistics would add weight to my opinion.

Regarding the position of instructors, I agree that they deserve recognition for their magnificent work, but I suggest that as most of them receive either the A.F.C. or A.F.M. (these medals take precedence of those under discussion), their reward is ample.

For my part I find, as do many others, complete satisfaction and content in being able to say, "I have been privileged to fly with the finest body of men in the world—the Royal Air Force."

R. E. WAKEFORD (W/O.).

SALUTE THE AMATEUR

A C.A.G. Pilot's Experience

I READ with much interest Indicator's "Salute the Amateur" (*Flight*, October 18th). The C.A.G. scheme enabled myself and a friend to take up flying and obtain our "A" licences, but when war broke out we were both considered too old for flying with the R.A.F., and at that time too inexperienced to join A.T.A. In 1941, however, when we had both grown a bit older, we were invited to join the R.A.F. and serve for three months as Link instructors, afterwards to become non-operational pilots.

The gentleman at the Air Ministry told his tale well and we both became L.T.I.s. When we tried to remuster after three months, however, we encountered many snags! My friend, taking advantage of our terms of entry, gave up the R.A.F. in disgust and joined A.T.A., where he made speedy progress and flew many types. He was killed—lost at sea—whilst on ferry duties after the war in Europe had ended.

After numerous applications and representations to put me on flying duties or give me my release, I finally made it after twelve months "binding." After that all went well and I served as an elementary flying instructor, obtaining an A2 category until the intensive glider expansions in 1944. Then, with others, I was given a flip or two in a glider and became a glider instructor. Some of us also lent a hand at tugging when occasion arose. After being awarded the A.F.M. for my services I was, because of my great age (41), declared redundant and posted to a holding unit, though my own station was one of the few in Training Command still working at full pressure.

Notwithstanding some 2,000 hr. of accident-free flying, an A2 category and an A1B medical category, I found myself on the "deck," where I remained in comparative idleness until my release.

While I am grateful for the experience, even in a non-operational capacity, I still feel that the R.A.F. could have made quicker and better use of us if they had accepted us at the outbreak of war. As it is, a great many of us seem to have achieved our usefulness not because of the R.A.F. but in spite of it!

EX-AMATEUR.

REFUELLING IN FLIGHT

A System with Dual Advantages

IN reply to the criticisms of F. Huntley (*Flight*, October 18th) of refuelling in flight, it appears he has not realised that this method is not only a method of "assisted take-off," but a method of safely increasing pay-load by reducing fuel load.

It has been shown that over a given distance with one refuelling the fuel load can be decreased by one-third, taking into account the safety measure of returning to base if contact is not made. With present machines this saving means by far a greater increase in pay-load than it did with pre-war

CORRESPONDENCE

machines, and the articles published in recent issues have shown how valuable this saving is.

The use of flight refuelling as a means of "assisted take-off," however, still shows advantages over other methods. An aircraft designed for, say, a take-off wing loading of 50 lb./sq. ft., but with a strengthened wing structure to allow refuelling in the air to bring the aircraft up to, say, 70 lb./sq. ft., can show far greater advantages over an aircraft which may have to take off at a rate of acceleration uncomfortable to the passengers; and where any breakdown would be most calamitous. Moreover, additional propulsive methods mean additional structure weight (for strengthening) not balanced by reduction in fuel load.

Developments during the war have not been towards improving the payload/gross weight ratio. We were building machines to defeat our enemies, not to fly trade routes economically.

The war is over and we have to think hard and act quickly if we are to gain any standing in air traffic. We have been shown a system which can be put into operation now, and it is *now* that we need it. GRAD.R.Ae.S.

Correcting Faulty Logic

IN *Flight*, October 18th, you publish a letter by a Mr. Huntley in which he gave as his opinion that "assisted take-off has now outdated flight refuelling." Not having been connected with aviation for as many years as this gentleman, I hardly like to venture a correction, but the logic of his statement appears to be so much at fault I cannot resist it.

Surely high wing-loadings, with inadequately lengthed runways, are the only reason for the adoption of the principle of assisted take-off, but whether an aircraft has a wing loading of, say, 30 or 60 lb./sq. ft., the total weight of the aircraft still equals structure wt. + fuel wt. + pay-load; and it is obvious that if the fuel load (i.e., fuel load at any given time) is reduced by the aid of refuelling in the air en route, then pay-load can correspondingly go up. Also, with refuelling you have no huge tanks which, for most of the distance, are doing nothing (except adding weight).

It might also be mentioned that the structure does not have to be stressed to withstand high wing-loadings and extra accelerating forces at take-off.

The rate of climb and general performance is not impaired as in the case of a heavily loaded (power and wing) aircraft, also the risk at take-off is considerably reduced and Granny need not suffer that horrible "+g" feeling which the passenger of any aircraft must have if it is being accelerated from rest to 150 m.p.h. in 1,000 yards or so.

I should think that some consideration should also be given to the fact that the ideal flight refuelled aircraft is a large medium-range type which could be used on the medium-length air routes (i.e., London-Paris-Stockholm, etc.) as well as the long-distance routes where it would operate with the aid of F.R.

This would eliminate the need for special aircraft for specific routes which, I understand, is the bugbear of airway operators.

APPRENTICE.

"THE TUNE HAS CHANGED"

A.T.C. Officers' Expenses

YOUR correspondent "Another One of Many" (*Flight*, October 18th) mentions three items in regard to A.T.C. officers which I also agree with: (1) They did their job after long hours at their own work or business; (2) Very little help from V.I.P.s; (3) Out-of-pocket expenses.

Regarding item (3) I can verify that many officers were put to considerable expense in travelling to and from their H.Q. to carry on the good work, apart from the fact that they also took charge of parties of cadets visiting R.A.F. stations, private aircraft factories, etc., where the expenses of cadets were paid from squadron funds, but the officer paid his own. They were also expected to contribute to squadron sports funds, and in one case were asked to provide the necessary funds for a free Christmas party for the squadron (and they duly paid up).

Other items, such as running their cars (using basic ration), where, in many instances, the squadron was dispersed in two or three schools in the district for the convenience of cadets living there, travelling to these places through fog and over icy roads—conditions under which an ordinary person would be safely indoors by a nice fire.

One other item so far not mentioned is "uniform allowance." Originally £15, later increased to £20, it did not by any means cover the initial outlay for an outfit. Tunic and slacks £10 10s., cap (forage) £1 9s. 6d. (Heaven knows why), two shirts with collars at £1 4s. each, raincoat at £4 10s., shoes and socks (black), gloves, etc., more than swallowed up the allowance. If a greatcoat was thought necessary (and it was during the winter months) the officer bought it out of his spare pocket money, from £10 10s. upwards; when a gracious Air Ministry consented to officers wearing a peaked cap (off ceremonial duty) no mention of allowance was thought of, and once again the officer went down his pocket, to the tune of at least £2 15s.

All renewal of items of kit after the first purchase has to be made by the officer (including coupons). Shirts, collars, ties, socks, and gloves do not last for ever, and wartime items increase in price, and the quality of material is definitely poorer, so more expense is incurred, and is as cheerfully paid, just to keep up the prestige.

One suit of uniform is supposed to last four years, and the raincoat five years, but I wonder how many officers have been allowed any renewal expenses for kit after 4½ years of real hard wear.

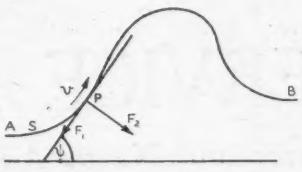
Perhaps a grateful Air Ministry will shortly realise it is time they did something about it, and make a further grant (and coupons as well) or is that, too, beneath the notice of the V.I.P.s? "ONE OF MANY."

DEFLEX-REACTION PROPULSION

Where the Argument Breaks Down

I HOPE the following will help to clear up the fallacy perpetrated by Mr. Umpleby in his article "Deflex-Reaction Propulsion" (*Flight*, September 13).

Let gas flow along any path through the aircraft at the rate of M lb. per sec., entering and leaving it with axial components of velocity V_A, V_B, respectively. Further let its velocity vary in any manner along the path. Let the tangent to the path at a point P, where the velocity is v, make an angle ψ with the axial direction. Let s be the distance along the path from A to P.



The mass of gas in an element ds of the path is $\frac{M}{v}\,ds$ lb.

Its acceleration is $\frac{v^2}{\rho} = v^2\frac{d\psi}{ds}$ normally and $v\frac{dv}{ds}$ tangentially $\therefore$ by Newton's Third Law the force exerted by this element on the aircraft is $F_1 = \frac{M}{v}ds \,.\, v\frac{dv}{ds}$ tangentially

and $F_2 = \frac{M}{v}ds \,.\, v^2\frac{d\psi}{ds}$ normally.

$\therefore$ The total axial thrust (poundals)

$$= F = \int_A^B \left(F_1\cos\psi - F_2\sin\psi\right) = M\int_A^B \left(\frac{dv}{ds}\cos\psi - v\sin\psi\frac{d\psi}{ds}\right)ds$$

But $\frac{d}{ds}\left(v\cos\psi\right) = \frac{dv}{ds}\cos\psi - v\sin\psi\frac{d\psi}{ds}$

$$\therefore\ F = M\left[v\cos\psi\right]_A^B$$

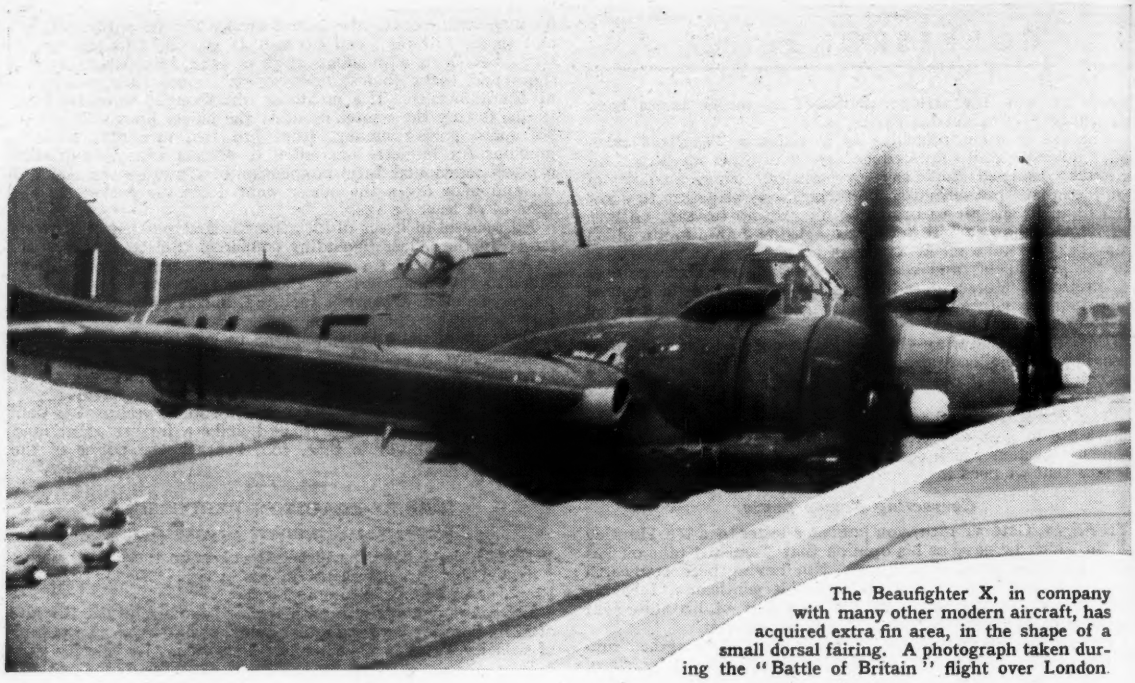
$$= M\left(V_B - V_A\right)$$

This proves that no matter how the gas is deflected within the aircraft, the total axial thrust is precisely the same, and thus deflex-reaction propulsion is doomed to failure.

The point at which Mr. Umpleby's argument breaks down is the assumption that the reaction at entry to the compressor is zero. This is true only if the aircraft is stationary, since when in motion, half the intake air moving with the velocity of the aircraft must be deflected through 180 degrees to enter the far side of the compressor, thus producing a negative thrust.

In the stationary case he considers, the exit velocity is 1,620 ft./sec. and the thrust is therefore $\frac{1,620}{g} = 50.6$ lb. The discrepancy between this and Mr. Umpleby's result of 69.37 lb. is due to an accumulation of errors in his calculations. For example, at exit from the compressor he states that angle c is 49 degrees, whereas it is obviously 32½ degrees. He has also given the gas a deflection in the turbine for which he has not included the corresponding negative thrust.

P. J. HIGGINS.



The Beaufighter X, in company with many other modern aircraft, has acquired extra fin area, in the shape of a small dorsal fairing. A photograph taken during the "Battle of Britain" flight over London.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

Awards

Naval Air Arm

FOR distinguished service, efficiency and zeal whilst serving in H.M. Ships *Emperor, Attacker, Searcher, Stalker, Pursuer* and *Hunter* in the clearance of the Aegean and the relief of Greece during the period 1944-1945.

Bar to Distinguished Service Order

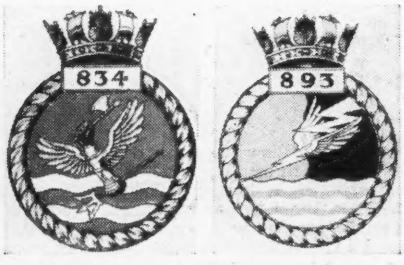
Capt. T. J. N. HILKEN, D.S.O., R.N.

Bar to Distinguished Service Cross

Act. Lt. Cdr. (A) G. C. BALDWIN, D.S.C., R.N.

Distinguished Service Cross

Act. Lt. Cdr. (A) M. F. FELL, D.S.O., R.N.



(Left) Badge of No. 834 Squadron, Naval Air Arm—"Una Feriendo Delemus" (By Striking Together we Destroy). On a blue field in base water barry wavy white and blue, two gauntlets conjoined winged gold, the upper grasping an axe, and the lower a trident also gold. (Right) Badge of No. 893 Squadron, Naval Air Arm—"Saepe Feriendum" (Strike Often). On a field per pale wavy blue and black, over water barry wavy in base white and blue, a ray of lightning, white winged gold, issuant in bend sinister.

Temp. Lt. (A) H. D. EASY, R.N.V.R.
Temp. Lt. R. J. STURGES, R.N.V.R.
Temp. Lt. (A) L. M. WENTON, R.N.V.R.
Sub. Lt. (A) H. J. PAIN, R.N.V.R.
Temp. Sub. Lt. (A) D. LEES-JONES, R.N.V.R.
Temp. Sub. Lt. (A) J. W. HERBERT, R.N.V.R.

FOR outstanding courage, determination and skill, while serving in H.M.S. *Nairana* in escorting a convoy to and from North Russia under continuous and fierce attacks by the enemy and in exceptionally hard weather conditions.

Bar to Distinguished Service Order

Capt. V. N. SUBTEES, D.S.O., R.N.

June 14th Birthday Honours

Distinguished Service Order

Act. Capt. K. S. COLQUHOUN, R.N.

FOR outstanding skill, bravery and devotion to duty, whilst serving in H.M. Ships *Trumpeter, Searcher* and *Queen* in successful air strikes against a U-boat base at Kilboln, Norway.

Bar to Distinguished Service Cross

Lt. (A) J. S. TONER, D.S.C., R.N.V.R.

Distinguished Service Cross

Lt. Cdr. C. L. F. WEBB, R.N.
Act. Lt. Cdr. R. A. BIRD, R.N.
Act. Lt. Cdr. J. M. GLASER, R.N.
Temp. Lt. (A) W. N. SAILES, R.N.V.R.
Temp. Sub. Lt. (A) T. LEA, R.N.V.R.
Temp. Sub. Lt. (A) H. J. PAIN, R.N.V.R.
Temp. Sub. Lt. (A) J. A. PULLIN, R.N.V.R.

Distinguished Service Medal

Temp. Chief P/O. Airman W. R. ASTBURY.
P/O. Airman K. R. W. TYLER.

FOR marked skill, zeal and devotion to duty, whilst serving with Naval Air Squadron 819.

Bar to Distinguished Service Cross

Temp. Lt. (A) S. J. BARKER, D.S.C., R.N.V.R.

FOR determination and address in air attacks on targets in Japan.

Bar to Distinguished Service Cross

Temp. Lt. (A) R. M. CROSLEY, D.S.C., R.N.V.R.

Distinguished Service Cross

Act. Lt. Cdr. (A) D. G. PARKER, R.N.V.R.
Temp. Lt. R. H. GRAY, R.C.N.V.R.
Temp. Lt. W. H. I. ATKINSON, R.C.N.V.R.
Temp. Lt. (A) N. GOODFELLOW, R.N.V.R.
Sub. Lt. (A) G. D. ROBERTS, R.N.V.R.

FOR excellent and devoted service as Air Radio Officer of No. 819 Naval Air Squadron to which was due much of the operational success of the squadron.

M.B.E.

Temp. Lieut. (Elec.) C. W. DUNNETT, R.C.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

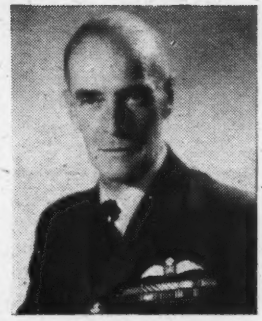
Bar to Distinguished Flying Cross

Act. Wing Cdr. F. H. DENTON, D.F.C., R.A.F.O., No. 487 (R.N.Z.A.F.) Sqn.
Act. Sqn. Ldr. P. R. CLAPHAM, D.F.C., R.A.F.V.R.
Act. Sqn. Ldr. S. CLAYTON, D.S.O., D.F.C., D.F.M., R.A.F., No. 464 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. K. J. HARDING, D.F.C., R.A.F.V.R., No. 197 Sqn.
Act. Sqn. Ldr. A. C. HENDERSON, D.F.C., R.A.F.V.R., No. 21 Sqn.
Act. Sqn. Ldr. M. T. S. RUMBOLD, D.F.C., R.A.F.V.R., No. 263 Sqn.
Flt. Lt. G. S. BLISS, D.F.C., R.A.F.V.R., No. 21 Sqn.
F/O. A. H. MCKEE, D.F.C., R.A.F.V.R., No. 21 Sqn.
Sqn. Ldr. J. R. BEIRNES, D.F.C., R.C.A.F., No. 438 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. R. E. COFFEY, D.F.C., R.C.A.F., No. 440 Sqn.
Act. Sqn. Ldr. J. L. MCCAUL, D.F.C., R.C.A.F., No. 136 Wing.
Act. Sqn. Ldr. A. H. SMITH, D.F.C., R.N.Z.A.F., No. 197 Sqn.
Flt. Lt. S. F. BROWNE, D.F.C., R.N.Z.A.F., No. 485 (N.Z.) Sqn.
Flt Lt. O. L. HARDY, D.F.C., R.N.Z.A.F., No. 485 (R.N.Z.A.F.) Sqn.
Act. Sqn. Ldr. T. SMART, D.F.C., No. 229 Sqn. (with effect from April 11th, 1943) (since deceased).
Act. Sqn. Ldr. J. V. VERRAN, D.F.C., R.A.F.O., No. 83 Sqn. (with effect from August 25th, 1944).

Distinguished Flying Cross

Act. Sqn. Ldr. A. S. PERKINS, R.A.F.V.R., No. 83 Sqn. (with effect from August 26th, 1944) (since deceased).
Flt. Lt. W. E. FREW, R.A.F., No. 83 Sqn. (with effect from August 25th, 1944) (since deceased).
Flt. Lt. I. W. HARRIS, R.A.F., No. 2 Sqn. (with effect from May 27th, 1944).

Flt. Lt. E. P. C. KIDD, R.A.F.V.R., No. 161 Sqn. (with effect from March 29th, 1945) (since deceased).
Flt. Lt. J. J. PAYTON, R.A.F.V.R., No. 56 Sqn. (with effect from April 23rd, 1945).
Flt. Lt. F. J. REAHILL, R.A.F.V.R., No. 2 Sqn. (with effect from June 17th, 1944) (since deceased).
Act. Flt. Lt. D. G. WILLIAMS, R.A.F.V.R., No. 139 Sqn. (with effect from January 1st, 1945) (since deceased).
F/O. F. W. LARCEY, R.A.F.V.R., No. 604 Sqn. (with effect from April 16th, 1943) (since deceased).
F/O. J. A. D. SHEMELD, R.A.F.V.R., No. 137 Sqn (with effect from December 30th, 1944) (since deceased).
F/O. W. C. VATCHER, R.A.F.V.R., No. 174 Sqn. (with effect from July, 25th, 1944) (since deceased.
P/O. K. W. BORDYCOTT, D.F.M., R.A.F.V.R., No. 156 Sqn (with effect from April 16th, 1943) (since deceased).
P/O. L. S. CLARK, R.A.F.V.R., No. 197 Sqn. (with effect from July 4th, 1944) (since deceased).
P/O. B. A. PULLIN, R.A.F.V.R., No. 582 Sqn. (with effect from August 12th, 1944) (since deceased).
P/O. M. J. A. ROSE, R.A.F.V.R., No. 3 Sqn. (with effect from February 9th, 1945).
Act. W/O. A. D. CLAYTON, R.A.F.V.R., No. 635 Sqn. (with effect from January 4th, 1945).
Flt. Lt. J. A. LOFTUS, R.C.A.F., No. 463 (R.A.A.F.) Sqn. (with effect from February 20th, 1945).
Act. Flt. Lt. D. M. MCKENZIE, R.C.A.F. (with effect from March 28th, 1943).
F/O. N. A. BURNS, R.C.A.F., No. 442 (R.C.A.F.) Sqn. (with effect from January 23rd, 1945).
F/O. J. W. H. CONWAY, R.C.A.F., No. 268 Sqn. (with effect from July 3rd, 1944).
Act. W/O. F. S. STROUTS (later P/O.), R.C.A.F., No. 109 Sqn. (with effect from March 23rd, 1943).
Act. Flt. Lt. G. R. JOBLIN, R.N.Z.A.F., No. 630 Sqn. (with effect from July 27th, 1944).
Act. Flt. Lt. J. E. GODDARD, R.A.A.F., No. 582 Sqn. (with effect from September 7th, 1944).
F/O. C. R. FAIRBAIRN, R.A.A.F., No. 50 Sqn. (with effect from January 31st, 1945).
Act. Sqn. Ldr. G. P. VICKERS, R.C.A.F., No. 88 Sqn. (with effect from August 12th, 1944).
F/O. H. J. FARQUHAR, R.A.F.V.R., No. 142 Sqn.
F/O. D. D. S. FERGUSON, R.A.F.V.R., No. 550 Sqn.
F/O. J. N. FERGUSON, R.A.F.V.R., No. 90 Sqn.
F/O. D. B. FRANCIS, R.A.F.V.R., No. 450 (R.A.A.F.) Sqn.
F/O. P. E. FREY, R.A.F.V.R., No. 171 Sqn.
F/O. R. N. GODWIN, R.A.F.V.R., No. 223 Sqn.
F/O. E. GOMERSAL, R.A.F.V.R., No. 192 Sqn.
F/O. C. F. GREEN, R.A.F.V.R., No. 571 Sqn.
F/O. W. L. GREEN, R.A.F.V.R., No. 75 (N.Z.) Sqn.
F/O. E. C. GRIMWOOD, R.A.F.V.R., No. 149 Sqn.
F/O. L. H. HANCOCK, R.A.F.V.R., No. 482 Sqn.
F/O. R. A. HANGER, R.A.F.V.R., No. 90 Sqn.
F/O. K. HANNEY, R.A.F.V.R., No. 101 Sqn.
F/O. R. A. J. HANSON, R.A.F.V.R., No. 185 Sqn.
F/O. G. J. HARVEY, R.A.F.V.R., No. 12 Sqn.
F/O. E. E. HESKETH, R.A.F.V.R., No. 10 Sqn.
F/O. J. M. HILL, R.A.F.V.R., No. 622 Sqn.
F/O. L. N. HILL, R.A.F.V.R., No. 146 Sqn.
F/O. A. J. W. HILLS, R.A.F.V.R., No. 622 Sqn.
F/O. C. H. HOUSDEN, R.A.F.V.R., No. 617 Sqn.
F/O. H. G. HOWELLS, R.A.F.V.R., No. 75 (N.Z.) Sqn.
F/O. F. B. JARMAN, R.A.F., No. 12 Sqn.
F/O. A. W. JENKINSON, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
F/O. D. G. W. H. JONES, R.A.F.V.R., No. 75 (N.Z.) Sqn.
F/O. D. L. JONES, R.A.F.V.R., No. 153 Sqn.
F/O. A. L. KEELEY, R.A.F.V.R., No. 9 Sqn.
F/O. T. A. KING, R.A.F.V.R., No. 635 Sqn.
F/O. T. KITCHING, R.A.F.V.R., No. 153 Sqn.
F/O. S. R. KURTON, R.A.F.V.R., No. 7 Sqn.
F/O. A. J. D. LEACH, R.A.F.V.R., No. 12 Sqn.
F/O. T. W. LEDINGHAM, R.A.F.V.R., No. 514 Sqn.
F/O. J. B. LEWIS, R.A.F.V.R., No. 102 Sqn.
F/O. F. W. LOVICK, R.A.F., No. 192 Sqn.
F/O. J. B. LUARD, R.A.F.V.R., No. 655 Sqn.
F/O. R. A. MARRIOTT, R.A.F.V.R., No. 150 Sqn.
F/O. L. J. MARSHALL, R.A.F.V.R., No. 10 Sqn.
F/O. A. MCMILLAN, R.A.F.V.R., No. 223 Sqn.
F/O. J. MEADOWS, R.A.F.V.R., No. 10 Sqn.
F/O. G. E. MEARNS, R.A.F.V.R., No. 550 Sqn.
F/O. P. A. MEWLAND, R.A.F.V.R., No. 102 Sqn.
F/O. R. A. D. NEWMAN, R.A.F.V.R., No. 582 Sqn.
F/O. A. E. OBAM, R.A.F.V.R., No. 199 Sqn.
F/O. L. M. PAGE, R.A.F.V.R., No. 83 Sqn.
F/O. H. PAUL, R.A.F.V.R., No. 7 Sqn.
F/O. A. R. PERRIN, R.A.F.V.R., No. 7 Sqn.
F/O. G. G. RUNNALLS, R.A.F.V.R., No. 619 Sqn.
F/O. R. SILVER, R.A.F.V.R., No. 149 Sqn.
F/O. G. W. SHRIMPTON, R.A.F.V.R., No. 102 Sqn.
F/O. W. SNOW, R.A.F.V.R., No. 582 Sqn.
F/O. R. D. SOMMERVILLE, R.A.F.V.R., No. 75 (N.Z.) Sqn.
F/O. R. I. STEVENS, R.A.F.V.R., No. 156 Sqn.
F/O. C. H. STEELE, R.A.F.V.R., No. 582 Sqn.
F/O. N. H. STIMSON, R.A.F.V.R., No. 625 Sqn.
F/O. M. W. STOTT, R.A.F.V.R., No. 158 Sqn.



Air Marshal Sir Grahame Donald, K.C.B., D.F.C., A.F.C., Air Officer C.-in-C., R.A.F. Maintenance Command.

F/O. G. A. REEVES, R.A.F.V.R., No. 7 Sqn.
F/O. J. J. REYNOLDS, R.A.F.V.R., No. 195 Sqn.
F/O. W. E. RICHARDSON, R.A.F.V.R., No. 195 Sqn.
F/O. R. E. ROBERTS, R.A.F.V.R., No. 115 Sqn.
F/O. S. N. ROWLEY, R.A.F.V.R., No. 138 Sqn.

Distinguished Flying Medal

Flt. Sgt. M. G. GODFRAY, R.A.F.V.R., No. 7 Sqn. (with effect from August 25th, 1944) (since deceased).
Flt. Sgt. (later P/O.) G. LISTER, R.A.F.V.R., No. 180 Sqn. (with effect from June 19th, 1944) (since deceased).
Act. Flt. Sgt. (now W/O.) D. NESS, R.A.F.V.R., No. 7 Sqn. (with effect from April 14th, 1943).
Flt. Sgt. W. HORNUNG, R.N.Z.A.F., No. 221 Sqn. (with effect from April 9th, 1943).
Flt. Sgt. F. P. LOWTHER, R.A.F., No. 357 Sqn.
Flt. Sgt. J. MCPHAIL, R.A.F.V.R., No. 613 Sqn.
Flt. Sgt. P. J. WAUGH, R.A.F.V.R., No. 69 Sqn.
Flt. Sgt. C. WINTON, R.A.F.V.R., No. 69 Sqn.
Flt. Sgt. A. B. WYTHE, R.A.F.V.R., No. 211 Sqn.

THE KING has been graciously pleased to approve the following award:—

O.B.E. (Mil.)

F/O. T. R. WHELER, D.F.C., R.C.A.F., No. 411 Sqn.

THE KING has been graciously pleased, on the advice of His Majesty's Australian Ministers, to approve the following awards in recognition of conspicuous service in operations against the Japanese:—

O.B.E. (Mil.)

Group Capt. L. V. LACHAL, R.A.A.F.
Wing Cdr. G. J. TOWERS, R.A.A.F.
Sqn. Ldr. H. M. I. MCIVOR, R.A.A.F.
Act. Flt. Lt. W. C. HALSTEAD, R.A.A.F.

THE KING has been graciously pleased, on the advice of His Majesty's Australian Ministers, to approve the following awards in recognition of brave conduct, to the undermentioned:—

George Medal

Cpl. J. KEAN, R.A.A.F.
Act. Cpl. V. J. DEAN, R.A.A.F.
L.A/C. M. J. GILL, R.A.A.F.
L.A/C. L. G. WALTERS, R.A.A.F.

B.E.M. (Mil.)

Sgt. L. W. HEINER, R.A.A.F.

Army Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in N.W. Europe:—

Third Bar to Distinguished Service Order

Lt. Col. (temp.) R. B. MAYNE, D.S.O., 1st Special Air Service Regt., Army Air Corps.

O.B.E. (Mil.)

W/O.1 M. BRIODY, Army Air Corps.

Military Cross

W/O.1 A. G. PARSONS, Army Air Corps.

Distinguished Flying Cross

Maj. (temp.) F. N. LANE, Royal Regt. of Artillery.
Capt. (temp.) S. H. DICKINSON, Royal Regt. of Artillery.
Capt. (temp.) A. R. M. KELLY, Royal Regt. of Artillery.
Capt. (temp.) R. A. LEE, Royal Regt. of Artillery.
Capt. (temp.) B. E. PURSALL, Royal Regt. of Artillery.
Capt. (act.) P. R. T. WALKER, Royal Regt. of Artillery.

Military Medal

Sgt. A. F. YOUNGMAN, Army Air Corps.
Pte. C. T. MOODY, 2nd Special Air Service Regt., Army Air Corps.

THE KING has been graciously pleased to approve the following award in recognition of gallant and distinguished services in the field:—

Military Medal

Pte. A. J. HOSE, Army Air Corps.

Roll of Honour

Casualty Communiqué No. 546.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

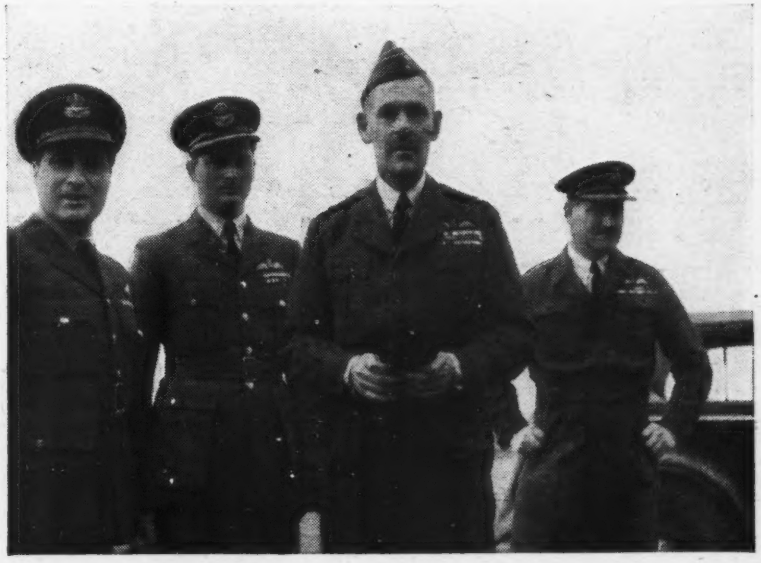
Of the names in this list, 199 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. A. R. Baker; Sgt. G. Ballinger; Flt. Sgt. D. L. Bond; Sgt. H. Brickell; Flt. Sgt. C. Crookes; Sgt. G. A. Ellison; Flt. Sgt. M. F. Essen; P/O. W. G. Evans; F/O. H. A. Fowler; Sgt. B. Gibbons; Act. Flt. Lt. J. S. Haig; F/O. G. B. Hanson; Flt. Sgt. R. Heads; Flt. Sgt. J. C. James; F/O. K. M. Johnson; Flt. Lt. H. King; Sgt. A. R. Logie; F/O. S. McLean; Sgt. P. McNiven; Sgt. W. A. Maxwell; Sgt. W. F. Murphy; Sgt. R. Palmer; Sgt. F. J. Pape; F/O. D. M. Roberts; F/O. W. E. Roberts; Flt. Sgt. G. B. Whalley; Sgt. T. Whiteley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. G. E. Allison.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. R. Armstrong; Flt. Lt. R. G. Ash; Sgt. G. J. J. Ashpole; Sgt. H. M. Atherton; Sgt. P. H. Baigent; Flt. Sgt. L. J. Barnes; Sgt. T. Barratt; F/O. J. Bolton;



Air Marshal Sir Roderick Hill, K.C.B., M.C., A.F.C., Air Member for Training, photographed during a recent visit to the H.Q. of the occupation forces. Also present are—Group Capt. M. T. Judd, D.S.O., D.F.C., A.F.C., Group Capt. A. E. Clouston, D.S.O., D.F.C., A.F.C., and Sqn. Ldr. R. C. Wright.

SERVICE AVIATION

Sgt. D. M. Brandrick; Sgt. E. R. Bray; Flt. Sgt. F. H. A. Braybrooke; Sgt. A. E. Bristow; Sgt. R. H. Brough; Sgt. D. H. G. Browett; Flt. Sgt. L. S. Bryan; Flt. Sgt. P. Bullimore; Sgt. F. H. E. Buxton; Flt. Lt. M. H. Carter; Flt. Sgt. W. R. Clifton; Flt. Sgt. A. Collins; Sgt. F. J. Collins; W/O. H. A. Corns; Sgt. S. Cottam; F/O. T. R. Court; P/O. C. Cousin; Act. Sqn. Ldr. G. Crawford, A.F.C., D.F.C.; W/O. V. A. Davis, D.F.M.; Flt. Lt. R. R. Densham; Flt. Sgt. H. C. Dent; Flt. Sgt. P. H. Douglas; W/O. A. T. Downing; F/O. L. H. Ellerker; F/O. H. W. Ellis; Sqn. Ldr. L. D. Emblem; Flt. Sgt. G. J. H. Fairs; Sgt. P. F. Fairweather; F/O. W. A. H. Fountain; P/O. S. F. Francis; F/O. A. G. Franklin; Act. Flt. Lt. R. J. Freeman; Sgt. G. F. Gibson; P/O. J. Gilmour; Sgt. R. J. Gracey; Sgt. J. Graham; Flt. Sgt. P. J. Hamilton; Sgt. J. W. Hampson; F/O. D. A. Harwood; F/O. N. R. Henderson; Flt. Sgt. H. Hepworth; P/O. L. W. Higgins; Sgt. T. S. Higgott; Act. Sqn. Ldr. R. J. Hopkin-Hill; Sgt. I. Howitt; P/O. D. Hughes; F/O. J. Hulme; Sgt. G. Humphreys; Sgt. T. K. Hunter; Sgt. D. J. Ingram; F/O. F. C. H. Johns, D.F.C.; Sgt. K. V. Jones; Flt. Sgt. R. T. Keen; Sgt. P. C. M. King; Sgt. E. Lancaster; Sgt. W. H. Latham; Sgt. W. H. V. Leach; Sgt. A. W. Lewis; P/O. R. W. Lowrey; W/O. M. M. McCannell; Sgt. C. MacFadyen; Sgt. J. H. McGlade; Sgt. K. M. McKie; P/O. J. McLaren; Flt. Sgt. A. MacLeod; Sgt. F. L. McMahon; Sgt. N. G. McSporran; Sgt. J. Maiden; P/O. R. J. Martin; Flt. Sgt. G. O. V. Messam; Sgt. J. F. Moran; Flt. Lt. J. E. Morriss; Sgt. S. E. Moss; P/O. M. G. Nelson; Sgt. W. A. E. Newton; W/O. W. Owens; F/O. D. Pickard; W/O. J. D. Pincus; Sgt. R. H. Pizer; Sgt. W. C. Pomfret; Flt. Sgt. A. R. Porter; P/O. G. C. Presland; Flt. Sgt. T. B. Preston; Sgt. A. R. Redfearn; Sgt. E. H. Reynolds; F/O. H. Richardson, D.F.M.; Sgt. K. V. Ritchie; F/O. F. G. Rudduck; P/O. P. E. Rushton; Sgt. W. C. Sadler; Sgt. F. W. Savage; Sgt. I. C. Seager; Sgt. A. J. Sellick; Sgt. O. F. Sisley; Sgt. F. N. Smith; F/O. J. G. Smith; Sgt. J. L. Stean; Flt. Sgt. R. E. Steed; Sgt. A. Stewart; Sgt. R. Stewart; Sgt. R. Stoten; Sgt. D. R. Taylor; Sgt. J. Taylor; W/O. W. H. K. Trewin; Sgt. J. Tulloch; Flt. Sgt. A. A. Waller; W/O. W. G. E. F. Walton; D.F.C., B.E.M.; Sgt. K. W. Warner; Flt. Sgt. E. C. Wicks; Flt. Sgt. K. E. Wiles; Sgt. W. E. Woodbine; Flt. Sgt. N. J. Woodcock; Sgt. K. B. Woodman; F/O. H. Woods.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. W. T. Bussell; Flt. Sgt. E. T. Cornelius; Sgt. T. A. Fairhurst; Flt. Sgt. K. C. Garner; P/O. F. C. Newman; Sgt. V. G. Price.

WOUNDED OR INJURED IN ACTION.—Sgt. F. N. Cole; Sgt. T. H. Hardy; Sgt. W. H. Hodson; Sgt. A. R. Kingston; F/O. J. T. Love; Flt. Sgt. J. MacKenzie; Sgt. R. M. Matthews; F/O. J. G. Potter.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. G. V. Hall; Flt. Sgt. P. L. Hodder; Flt. Lt. E. G. Hutchin; Sgt. G. Parker; F/O. J. W. Robson; Act. Flt. Lt. C. J. Slater.

MISSING.—Sgt. H. J. Allen; P/O. L. E. Arthars; P/O. A. J. Barton; Sgt. J. H. Bennie; Sgt. H. R. Butt; Flt. Sgt. J. H. Curley; Act. Sqn. Ldr. P. H. C. Hanbury, D.F.C.; F/O. J. N. F. Hanes; Flt. Lt. J. P. Hart, D.F.C.; F/O. J. A. W. Heatlie; Flt. Lt. B. L. Howell; Flt. Sgt. M. Jerome; W/O. S. Jones; Flt. Lt. J. E. McDonald; Sgt. A. W. A. Mason; Sgt. L. J. Mercer; Sgt. K. J. Parrish; W/O. F. Poole; W/O. R. A. Putman; Flt. Sgt. F. G. Richardson; F/O. A. G. Stass; Flt. Sgt. T. C. Tupman; Act. Flt. Lt. A. A. J. Van Amsterd; Sgt. K. J. Warren; F/O. J. V. A. Welply.

KILLED ON ACTIVE SERVICE.—F/O. H. E. Ackroyd; Sgt. H. G. Allan; Sgt. E. E. Barfoot; Flt. Sgt. J. H. Barnes; Sgt. R. J. Borland; Sgt. A. Brierley; Flt. Lt. M. J. T. Cane, D.F.M.; Sgt. W. G. Cooley; P/O. A. Darby; Flt. Lt. H. G. Featonby; A/C.1 G. Fishwick; Flt. Sgt. G. A. Flindall; F/O. G. W. R. Ford; Sgt. D. L. Hutchens; Sgt. M. G. B. James; Sgt. E. W. Jennings; Sgt. H. A. Johnson; Sgt. F. E. Jordan; Flt. Sgt. R. L. T. Knight; Flt. Lt. A. Lamb; Sgt. C. C. Lattimer; F/O. E. F. Mitchell; W/O. J. Muir, D.F.M.; F/O. G. A. Outterson; Sgt. J. R. Payne; Flt. Sgt. D. G. Pritchard; Flt. Sgt. A. J. Robertson; L.A/C. F. Roscoe; Sgt. D. J. Rowson; Flt. Sgt. F. G. Saunders; Flt. Lt. F. E. Sheppard, D.F.C.; F/O. J. Smellie; Flt. Sgt. G. C. McK. Stewart; L.A/C. B. W. D. Taylor; Flt. Sgt. V. A. Thompson; Flt. Lt. D. J. Thurgood; F/O. B. J. Walls; W/O. P. H. Watson; F/O. P. C. Williams; Flt. Lt. D. L. Wix, D.F.C.

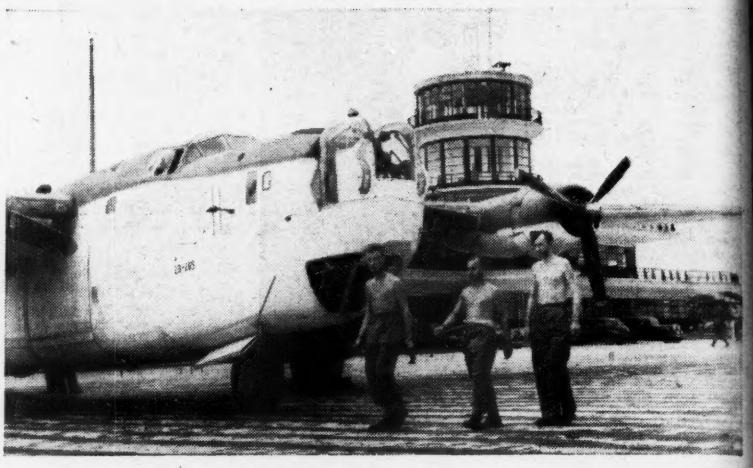
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. J. H. Anderson; A/C.1 J. J. Douglas; Flt. Lt. A. G. Edwards; Flt. Sgt. N. E. Hodges; Sgt. H. W. J. Mitchell; Cpl. H. Newstead; Flt. Sgt. A. A. O'Connor; F/O. R. C. Tourell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. J. C. Berry; Sgt. P. Crozier; Sgt. F. Dobbie; Sgt. E. H. Pitty; W/O. C. A. Winch; Sgt. E. G. Woodward.

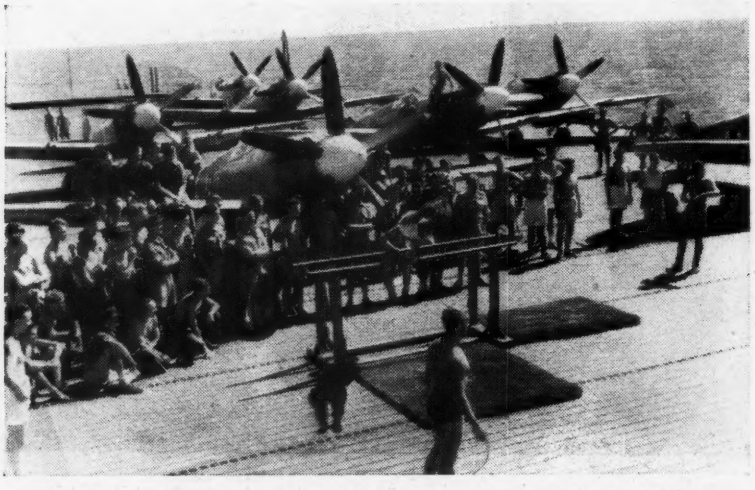
WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. F. G. Bass; Cpl. A. J. Burd; L.A/C. B. J. Cubberley; L.A/C. R. Dagnall; F/O. E. G. Davies; F/O. I. R. M. Davies; Flt. Sgt. G. E. Jones; A/C.2 L. R. Jones; Act. Flt. Lt. T. R. Parsons; F/O. H. K. Shawyer; Act. Flt. Lt. J. M. Stringer.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Lt. J. D. L. Hall; Sgt. A. H. Stinson.

DIED ON ACTIVE SERVICE.—A/C.1 J. Boddy; L.A/C. J. A. Bonner; Cpl. H. J. Green; L.A/C. H. B. Jones; A/C.2 C. A. Neale; L.A/C. E. A. Overton; L.A/C. R. H. Wild.



ENTER THE R.A.F.: A Liberator in front of the control tower at Kallang airfield, shortly after Singapore had been reoccupied.



NAVAL ENTERTAINMENT: The P.T. instructor of the carrier *Smiter* gives a demonstration to R.A.F. guests while on the way to Hong Kong. Spitfire XIVs are in the background.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. S. R. Bacon; Act. F/O. J. A. G. Beck, D.F.C.

MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. K. Goulder.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. J. J. Battle; F/O. A. C. Briant; P/O. R. W. Brown; Flt. Sgt. H. A. Cummins; Flt. Sgt. G. G. Podosky; F/O. J. R. R. Preston; Flt. Sgt. S. A. Smith; Flt. Sgt. R. Weekes.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. E. K. Adams; Act. F/O. D. D. Browne; Act. F/O. H. N. Cornish; Flt. Sgt. J. W. Douglas; Flt. Sgt. F. E. Fischer; Flt. Sgt. C. V. Krieg; P/O. P. C. Maughan; W/O. R. G. Perrett; Flt. Sgt. J. Pritchard; Flt. Sgt. B. Reece; Flt. Sgt. R. B. Templeton; Act. F/O. J. A. H. Wilkinson; Flt. Sgt. G. W. Wood.

MISSING, BELIEVED KILLED IN ACTION.—P/O. B. W. Brown.

MISSING.—Flt. Sgt. C. Delaney; Flt. Sgt. T. E. Chenoweth; Flt. Sgt. K. G. Clark; F/O. A. Lewis; Flt. Sgt. N. E. Peters.

KILLED ON ACTIVE SERVICE.—F/O. M. J. Neville.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. J. H. Clark; F/O. P. L. Soesman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. F. Brown; P/O. J. D. Buchanan; P/O. D. W. Burke; W/O. R. E. Clarke; F/O. J. R. O. Clerc; F/O. J. S. Cox; P/O. A. H. Durnin; F/O. L. H. C. Gardiner, D.F.C.; Flt. Lt. S. F. Garland; W/O. J. B. Gravelet-Chapman; P/O. J. A. K. Imrie; P/O. C. I. Jakeman; F/O. H. K. Jones; P/O. R. E. McDougall; Flt. Sgt. J. W. Moffat; F/O. J. A. W. Morgan; Flt. Sgt. M. F. Nelson; P/O. B. W. Pattle; P/O. B. F. Pothier, D.F.C.; Sgt. G. L. Preece; W/O. N. T. S. Reed; P/O. W. F. Reid; P/O. F. Roach; P/O. G. E. R. Robineau; W/O. J. A. Rooney; F/O. G. E. Scott; F/O. W. J. Shearstone; Flt. Sgt. S. L. Silver; W/O. M. E. Soules; P/O. G. R. Warnock; P/O. R. D. Whitson; Flt. Lt. M. Wood.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Lt. J. P. Barlow.

WOUNDED OR INJURED IN ACTION.—Sgt. A. J. Grant.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. A. Dorey; Sgt. A. P. Campbell; F/O. I. Lindzon; Sgt. J. S. McIver; Flt. Lt. W. G. McRae; F/O. H. Parker; F/O. W. A. Payne; F/O. E. W. Pollard.

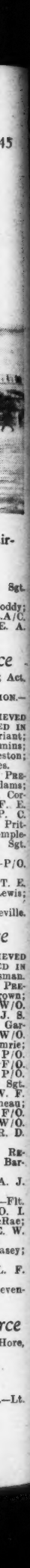
MISSING.—F/O. F. R. Alty; F/O. J. J. Casey; F/O. P. B. Dennison; F/O. M. Hartog.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. L. F. Jarvis; Flt. Sgt. S. G. Redknap.

DIED ON ACTIVE SERVICE.—W/O. L. H. Stevenson.

Royal New Zealand Air Force

KILLED ON ACTIVE SERVICE.—F/O. M. L. Hore, D.F.C.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Lt. E. J. Van Heerden.